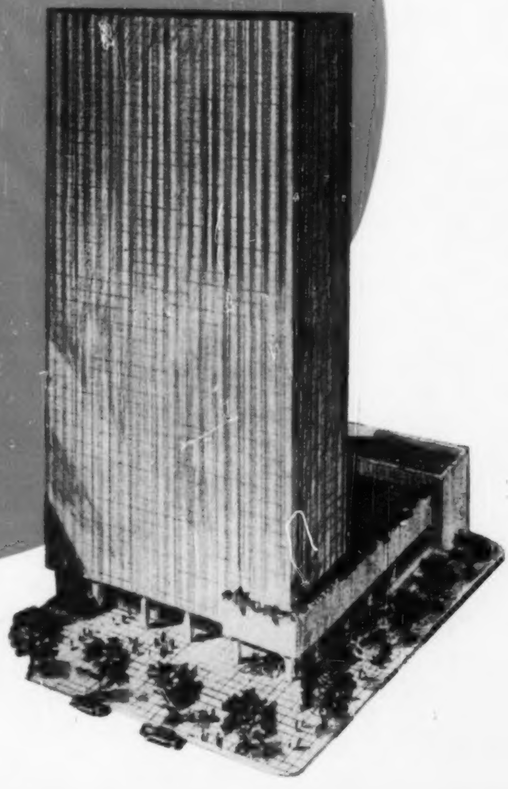
MECHANICAL ENGINEERING

January, 1958

In Two Sections • Section One

Complete Contents on Pages 3 and 5



The New United Engineering Center

MECHANICAL ENGINEERING

PUBLISHED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Contents

VOLUME 80 • NUMBER 1 • JANUARY, 1958

MECHANICAL ENGINEERING
PUBLISHED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

ADVERTISING DEPARTMENT

in this issue

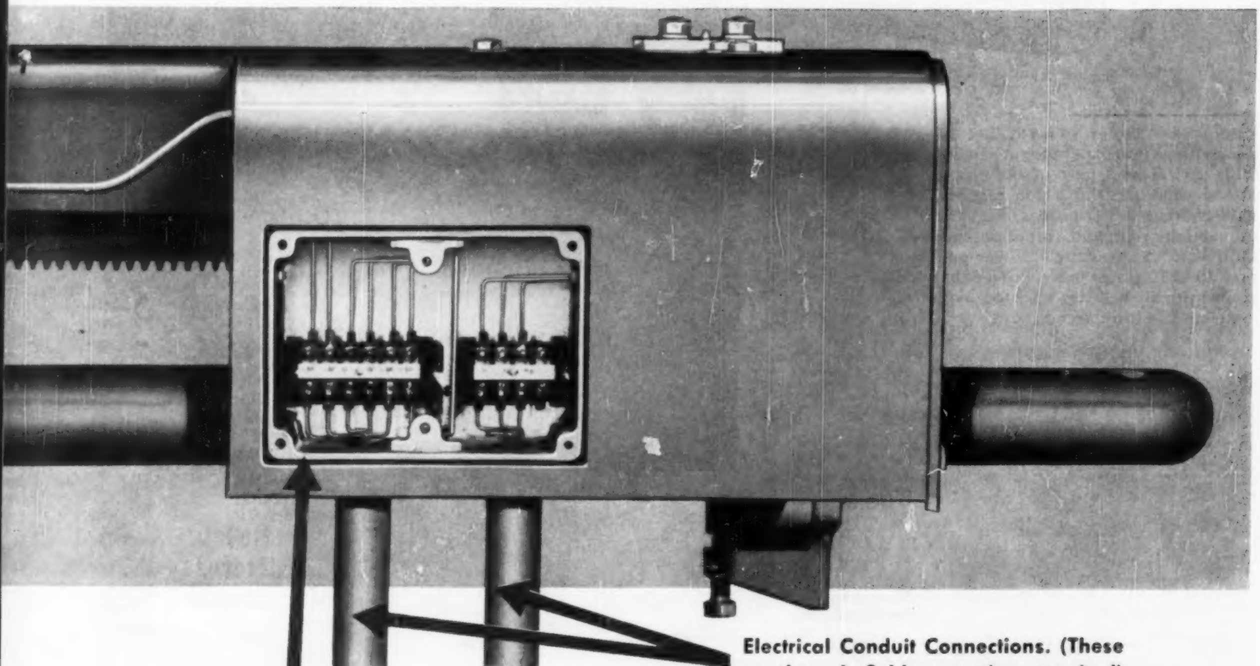
VOLUME 80 • NUMBER 1 • JANUARY, 1958

departments

IMPORTANT FEATURE

of the new Diamond series 300 IK

LONG RETRACTING BLOWER



Electrical Conduit Connections. (These are the only field connections required)

Motor and Control Electrical Terminal Facilities centered in weather-resistant enclosure at drive end for improved accessibility and protection. (cover removed)

New Series 300 IK Long Retracting Blower.

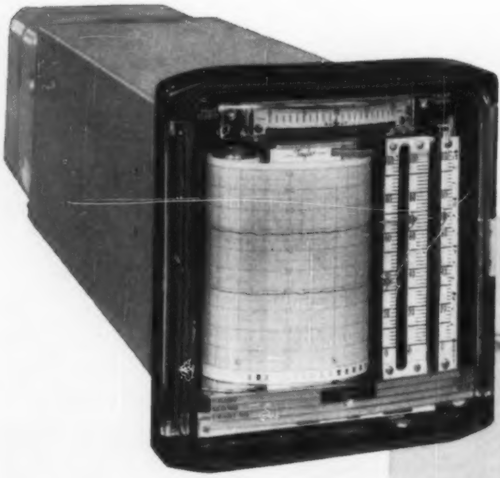
7703

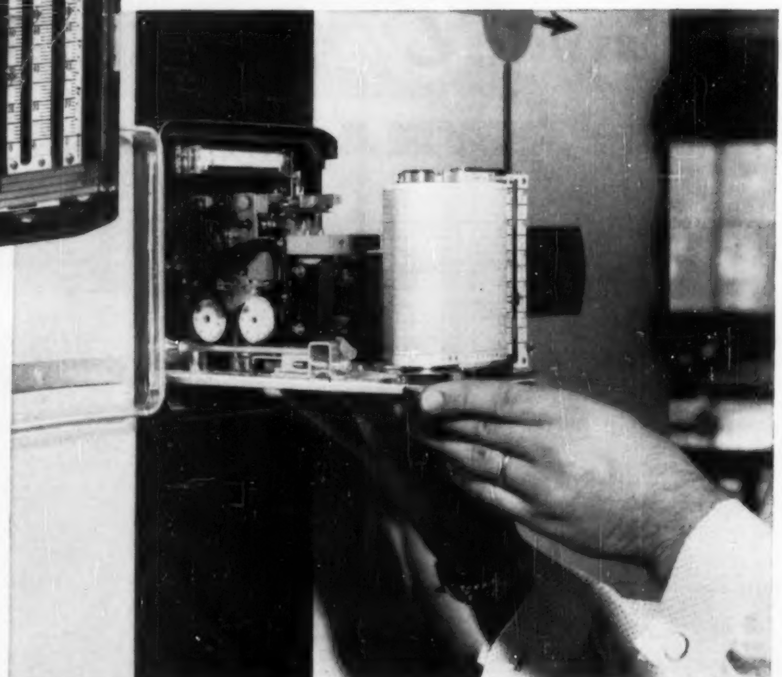
"You Clean Boilers Better and at lower Cost with Diamond Blowers"

SPECIALTY CORP. **LANCASTER, OHIO**

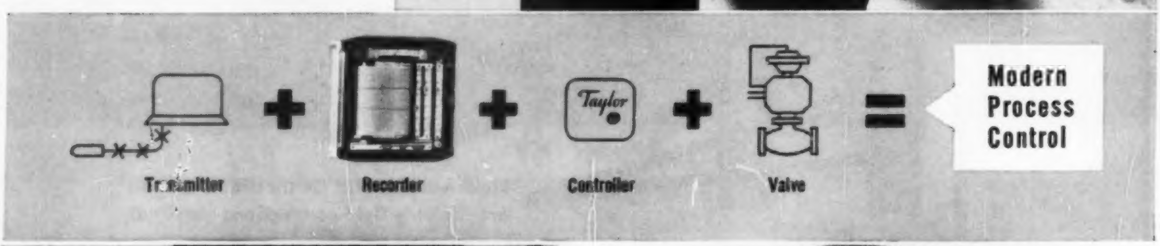
Diamond Specialty Limited • Windsor, Ontario

Never before

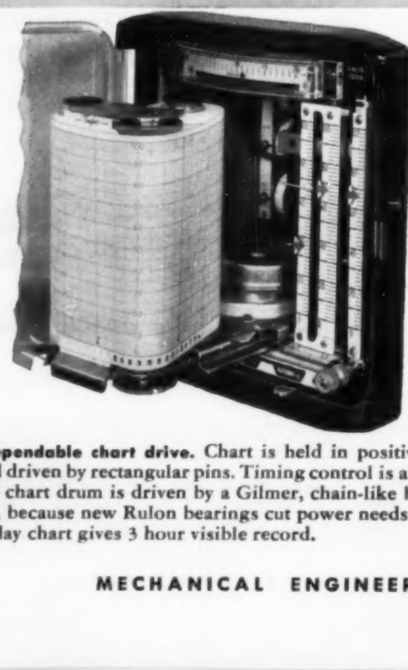




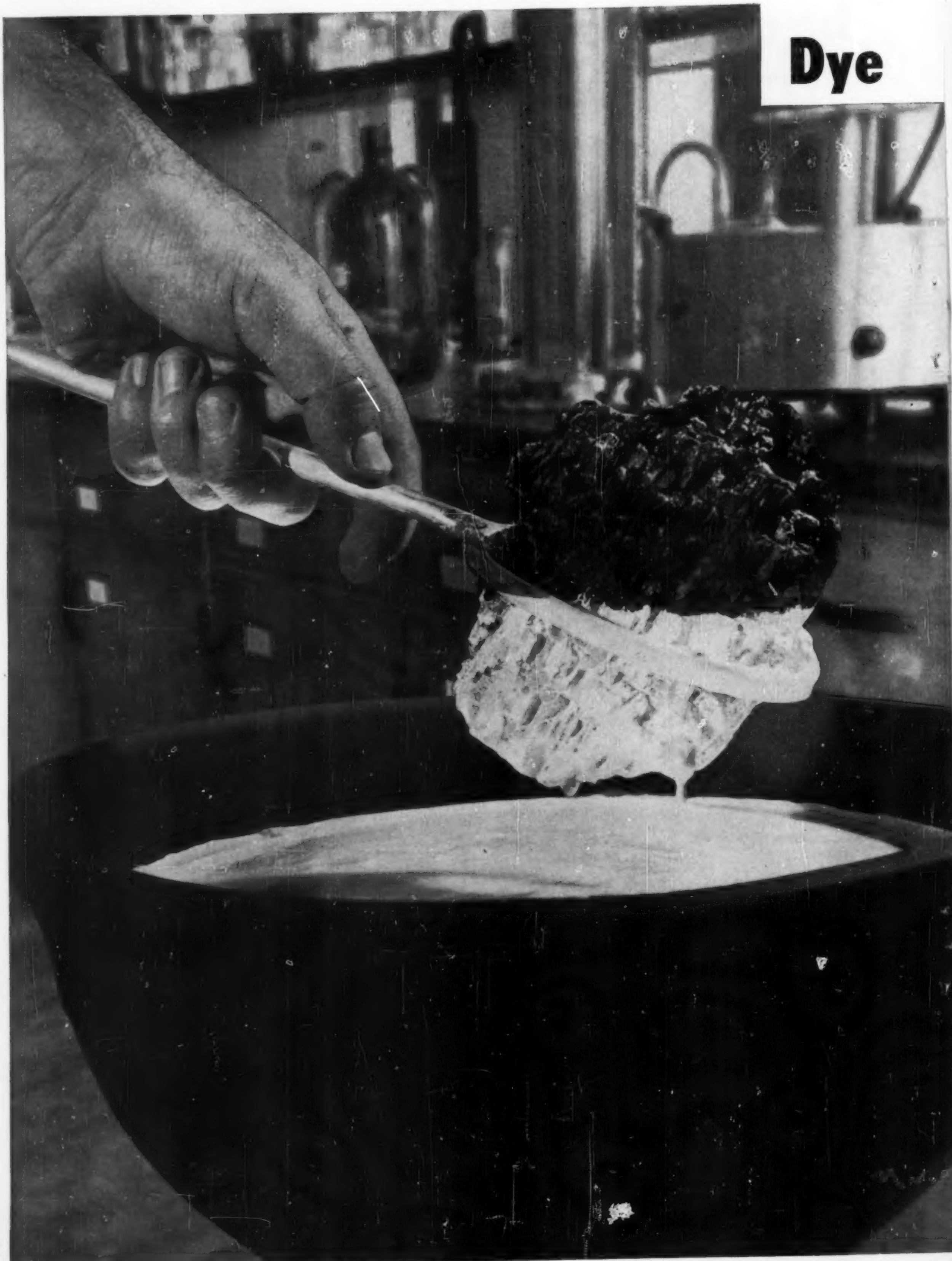
Unique new Taylor TRANSCOPE Recorder plugs into panel-mounted manifold—an integral part of the sleeve. Model shown is the 2 pen recorder with continuous set point, automatic-to-manual switch and output pressure indicator. "Servomatic" power pens provide 150 times more power than conventional bellows-actuated type, assuring life long accuracy.



Controller settings are made from the front while recording. Gain, reset and PRE-ACT* dials are calibrated in specific units. Eliminates blind adjustments—settings and results are seen in one spot . . . the front of the panel.



Most dependable chart drive. Chart is held in positive position and driven by rectangular pins. Timing control is absolute, because chart drum is driven by a Gilmer, chain-like belt. No jerking, because new Rulon bearings cut power needs in half. 4", 30-day chart gives 3 hour visible record.



Dye

maker brightens fuel cost picture

Burning coal at Toms River-Cincinnati saves 20% on fuel costs, permits clean steam generation

The Toms River-Cincinnati Chemical Corp. plant in Toms River, N.J. is the most modern plant of its kind in the world. Producing vat dyestuffs requires a large dependable steam supply for chemical processes and heating purposes. To fill these requirements, the power plant at Toms River-Cincinnati is as up-to-date and efficient as the general plant itself. The fuel used for steam generation is *coal* because, on the basis of cost per thousand pounds of steam, the nearest competitive fuel costs 20% more than coal. In addition, thanks to automatic operation and modern equipment, the power plant meets the rigid standards of cleanliness required in such manufacturing operations.

Facts you should know about coal

Not only is bituminous coal the lowest-cost fuel in most industrial areas, as in the case of Toms River-Cincinnati, but up-to-date coal burning equipment can give you 10% to 40% more steam per dollar. Today's automatic equipment pares labor costs and eliminates smoke problems. And vast coal reserves plus mechanized production methods mean a constantly plentiful supply of coal at stable prices.

Technical advisory service

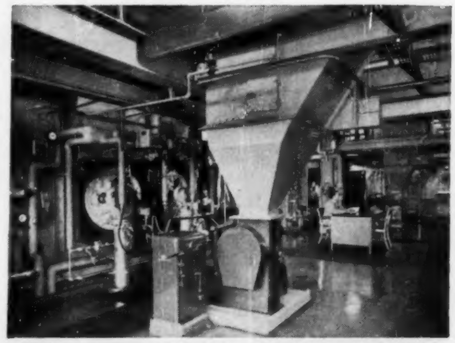
The Bituminous Coal Institute offers a free technical advisory service on industrial fuel problems. We welcome the opportunity to work with you, your consulting engineers and architects. If you are concerned with steam costs, write to the address below. Or send for our case history booklet, complete with data sheets. You'll find it informative.

Consult an engineering firm

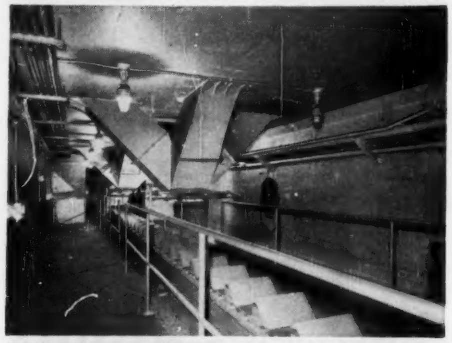
If you are remodeling or building new heating or power facilities, it will pay you to consult a qualified engineering firm. Such concerns—familiar with the latest in fuel costs and equipment—will effect great savings for you in efficiency and fuel economy over the years.

BITUMINOUS COAL INSTITUTE

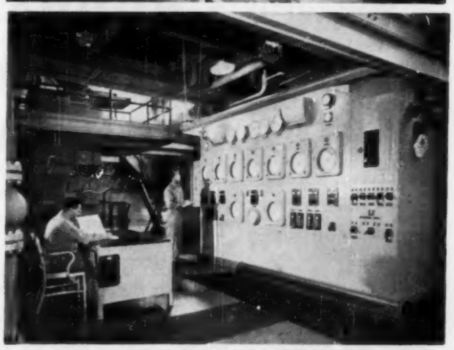
Southern Building • Washington 5, D. C.



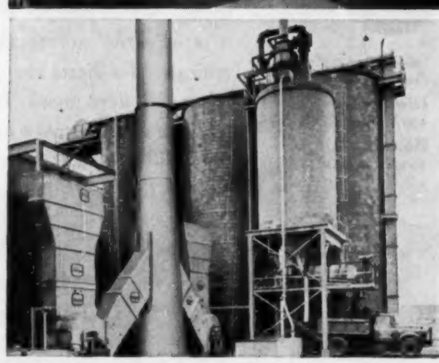
View of boiler room showing both 50,000 lbs. hr. boilers, by Riley Stoker Corp. Each has two burners. Center foreground is automatic weigh scale, by Richardson Scale Co., which receives coal through hopper from live storage bin and passes it to coal feeder. Coal is fed to Riley Pulverizer in basement, then blown back up to burners.



Close-up of Gifford-Wood Roundabout Bucket Conveyor beneath coal storage silos. Transversing feeder-car is used when coal is emptied from silo and conveyed to live storage bin.



Automatic combustion control and instrument panel by Bailey Meter Co.



Fly ash being loaded on truck through a dustless rotary unloader. Fly ash is collected by Prat-Daniel Mechanical Precipitators. A pneumatic ash collecting system by United Conveyor (with tie-ins under air heater and at base of stack) removes it to this 20-ton ash silo. In the rear are three 330-ton coal silos.

... Fluid Power news

REPORT No. 11,501

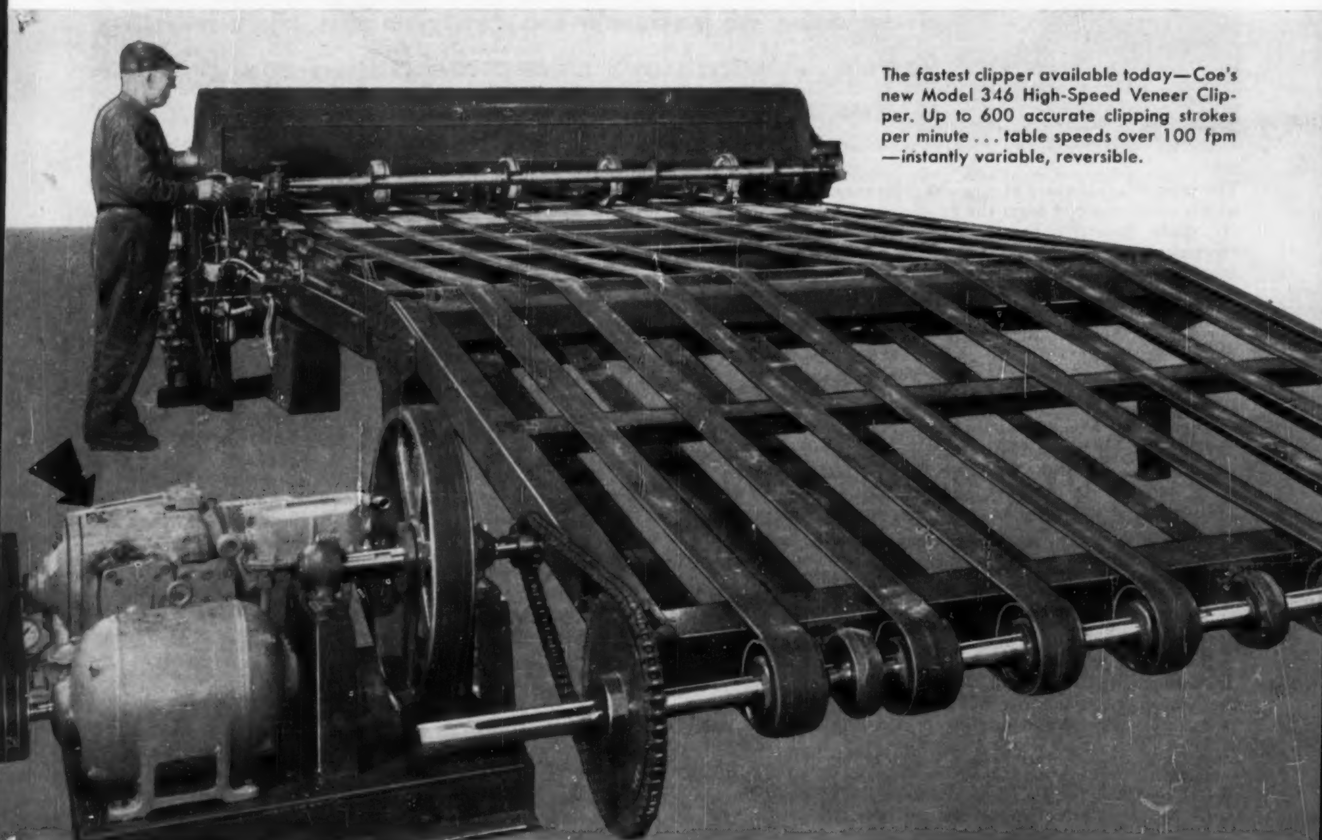
HIGH-SPEED FEED TABLE DRIVE AND CONTROL

From Oilgear Application-Engineering Files

HOW OILGEAR "ANY-SPEED" DRIVES BOOST VENEER CLIPPING SPEEDS—ACCURACY

CUSTOMER: *Coe Machinery Company, Painesville, Ohio*

DATA: For high-speed, accurate sizing of single sheets of veneer in motion, table feed drives for new veneer clippers must be instantly, infinitely variable, and instantly reversible to clear slips and jams at the knife if ragged or defective veneer is encountered. Complete control should be through a remote, single lever. Drive must be rugged, compact, trouble-free . . . provide smooth, stepless, shock-free, uniform acceleration and deceleration from zero to maximum in either direction . . . easy to install and maintain.



The fastest clipper available today—Coe's new Model 346 High-Speed Veneer Clipper. Up to 600 accurate clipping strokes per minute . . . table speeds over 100 fpm—instantly variable, reversible.

SOLUTION: Shown above as standard equipment on Coe's new Model 346 high-speed veneer clippers are Oilgear heavy-duty DHC-88, two-way, *Any-Speed* Transmissions. Coe reports, "Variable table speeds are instantaneously afforded in forward and reverse. These drives are arranged to give belt speeds from approximately 70 to 175 fpm by movement of a single lever. The quick stop and reverse of this drive is very desirable if ragged or defective veneer slips and jams at the knife. This drive is equally desirable when the table drive is used to unload veneer storage decks between the clipper and the lathe." Oilgear *Any-Speed* Drives bring out the best in machines due to the many other "plus" features such as: cushioned power; automatic overload protection; automatic electric power conservation; totally sealed—safe in hazardous atmospheres; constant torque; automatically self-lubricated to insure long, trouble-free life.

Machinery manufacturers and users agree that for superior heavy-duty performance on sawmill carriages, gang-saw feeds, conveyors, capstans, winders, centrifuges, textile, paper, tape, rubber, and food processing equipment—it's Oilgear . . . for the lowest cost per year!

For similar practical solutions to YOUR linear or rotary drive and control problems, call the factory-trained Oilgear Application-Engineer in your vicinity. Or write, stating your specific requirements directly to . . .

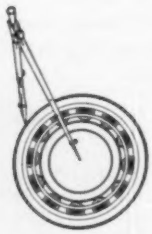
THE OILGEAR COMPANY

Application-Engineered Fluid Power Systems

1570 WEST PIERCE STREET • MILWAUKEE 4, WISCONSIN

ONE OF A SERIES OF INFORMATIVE MESSAGES FROM HYATT...

How Separable Race Roller Bearings with Interchangeable Parts can Improve Machine Design...



With HYATTS, the designer can increase shaft diameter or reduce housing bore by omitting races... eliminate selective fitting for greater flexibility of assembly operations

The unique advantages of straight cylindrical roller bearings which result directly from the geometry of the bearing itself are quite generally accepted by design engineers. They recognize, for example, that cylindrical roller bearings provide greater radial load-carrying capacity because of the larger area of contact between races and rollers. Most designers are also aware that straight cylindrical roller bearings offer the lowest roller bearing friction characteristics because this type most closely approaches true rolling action.

However, a well-designed line of roller bearings provides additional advantages which are not inherent in the bearing geometry, but result from the engineering know-how of the manufacturer. These benefits are not so widely known and are sometimes overlooked by designers.

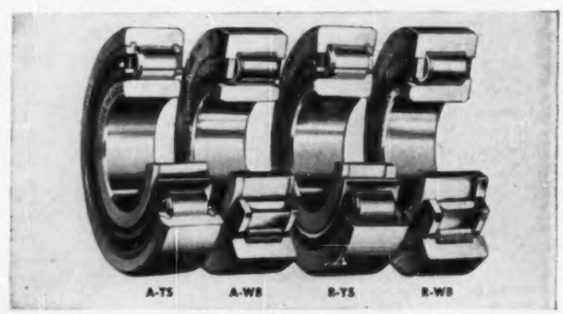
1. INTERCHANGEABLE PARTS PERMIT MORE FLEXIBLE ASSEMBLY

A good example of these "built-in" benefits is the interchangeability of separable bearing parts provided in the HYATT line of cylindrical bearings. Any HYATT Hy-Load Series separable inner race, for a given piece number, can be assembled with any HYATT outer race and roller assembly of the same piece number. Only under special circumstances is there any necessity for selectively matching separable parts of HYATT Hy-Roll Bearings.

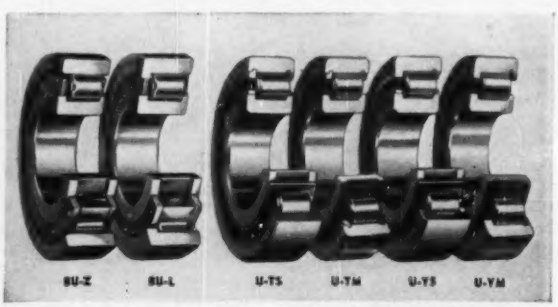
Because of this interchangeability feature, it is practical to install separable HYATT inner races on shafts in one location while the outer races and rollers are installed in housings at another location. When the sub-assemblies are brought together the bearing parts will match perfectly; there is seldom any need for selective assembly. This flexibility of any assembly operation in which selective fitting is eliminated can often be a determining factor in bearing selection.

2. SEPARABLE INNER RACES PERMIT INCREASED SHAFT DIAMETERS

Another advantage of HYATT separable bearings becomes evident when the designer wishes to use a larger, more rigid shaft without increasing the size of the housing bore. He can neatly solve the problem by eliminating the inner race of one of the bearing types shown in Figs. A and D, and operating the bearing rollers directly on the suitably hardened and ground shaft. The space usually occupied by the inner race then becomes available for a shaft of larger diameter.



A. Cutaway views of HYATT Hy-Load separable inner race types



B. Cutaway views of HYATT Hy-Load separable outer race types
B-1. Cutaway views of HYATT Hy-Load non-separable types *(right)*

3. SEPARABLE OUTER RACES PERMIT REDUCED HOUSING BORE SIZES

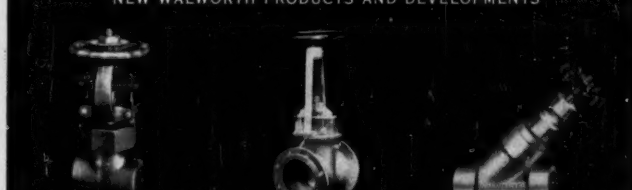
Conversely, when space limitations or other considerations make it necessary to reduce the size of the housing bore without decreasing shaft diameter, HYATT separable bearings are again the answer. In this case, the designer merely eliminates the outer race of one of the bearing types shown in Figs. B and E, and operates the rollers directly on the suitably hardened and ground bore, thus saving the space normally occupied by the outer race. Of course, in applications where it is preferable to retain the bearing parts as a unit, HYATTS are available in non-separable assemblies (Figs. B-1 and F).

In the first stage of thermal shock test, oil fire and gas flame heat a 6-inch Walworth Gate Valve constructed of ductile iron to a red hot temperature of 1350°F.

Now the Walworth Valve is quickly chilled with streams of water. A cast iron valve could shatter under such a drastic and rapid change in temperature.

Slightly scorched, the valve keeps its shape and dimensions despite the ordeal and is completely operable. The test proved that, under these conditions, Walworth ductile iron valves have a thermal shock resistance equal to that of more expensive steel valves.

NEW WALWORTH PRODUCTS AND DEVELOPMENTS



FORGED STEEL WEDGE GATE VALVES	FABRICATED PULP STOCK VALVES	PVC VALVES AND FITTINGS
. . . for water, steam, gas, and air service to 850°F. Oil or oil vapor to 1000°F. OS & Y types. Screwed or socket welding ends. Bolted or union bonnets. Sizes from 1/4 to 2 inches.	. . . for lines carrying pulp stock in varying concentrations, slurries, and other fibrous materials in suspension. All-welded stainless steel construction. Corrosion resistant. Sizes from 3 to 30 inches.	...made of rigid, unplasticized polyvinyl chloride. Highly resistant to chemical attack. Non-toxic, Non-aging. Extremely low flammability. Sizes from 1/2 to 4 inches.

WALWORTH VALVES AND FITTINGS

WALWORTH

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

SOUTHWEST FABRICATING & WELDING CO., INC. • M&H VALVE AND FITTINGS CO. • WALWORTH COMPANY OF CANADA, LTD.

General Cable solves 4-way pumping problem

How to secure maximum rate of production for varying sizes and types of lead sheathed telephone cable posed a 4-way problem for General Cable Corp.

1. Since the maximum extrusion rate for lead through a sheathing die varies for different size cables, hydraulic pumps must have variable capacity characteristics so they can be set for the exact capacity giving maximum rate of production for each cable size.
2. Pumps have to be able to maintain pressures *accurately* at any given point between 4500 and 6000 psi. The pump pressure controls the rate of cable production which is impaired by any variation in pressure.
3. 100% dependability is a must. Any failure of pump or press could result in a break in the sheathing and rejection of an entire reel.
4. Pumps must handle water as a hydraulic medium . . . completely eliminating any fire hazard.

General Cable solved the problem by installing Aldrich-Groff variable stroke pumps . . . the first in 1942, followed by 3 more in 1944, 1948 and 1949. Eleven others were added in various General Cable plants. Aldrich-Groff Pumps provide stepless, straight-line capacity control from zero to rated output. Pump delivery can be adjusted for the maximum rate of extrusion for the size and type of cable being covered and pressures are accurately maintained indefinitely.

Result: Since their installation, these Aldrich-Groff Pumps have more than met the Company's need for accuracy and reliability. They operate continuously, around the clock, six days a week. On one occasion, three of the pumps operated continuously for six months! If you have a pumping problem, we'll be glad to send you full information on Aldrich Pumps and their advantages to you. Write Aldrich Pump Company, 29 Pine Street, Allentown, Pa.

the toughest pumping problems go to ALDRICH

Westinghouse airfoil blading now gives you . . .

FULL-RANGE APPLICATION

General Purpose — Classes I and II
Up to 6¾″ Total Pressure

Heavy-Duty — Classes III and IV
Up to 16¾″ Total Pressure

Up to 700,000 CFM

WITH

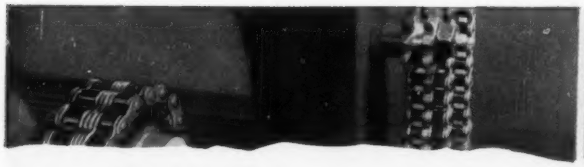
- Lowest Operating Costs . . . High Efficiency — Low Horsepower!
- Quiet Operation . . . Airfoil Blading — Streamlined Air Flow!
- Capacity Protection . . . Steep Pressure Curve — Minimum Capacity Variation!
- Non-Overloading Power Feature! Full Load at Motor Rating — No Overload!
- AMCA (NAFM) Standard Sizes

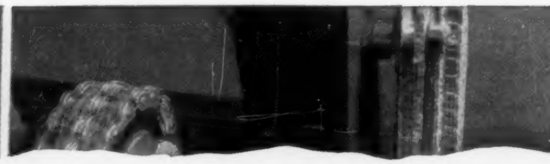
Call your Sturtevant Division Sales Engineer or write Westinghouse Electric Corporation, Department A-3, Hyde Park, Boston 36, Mass.

J-80645

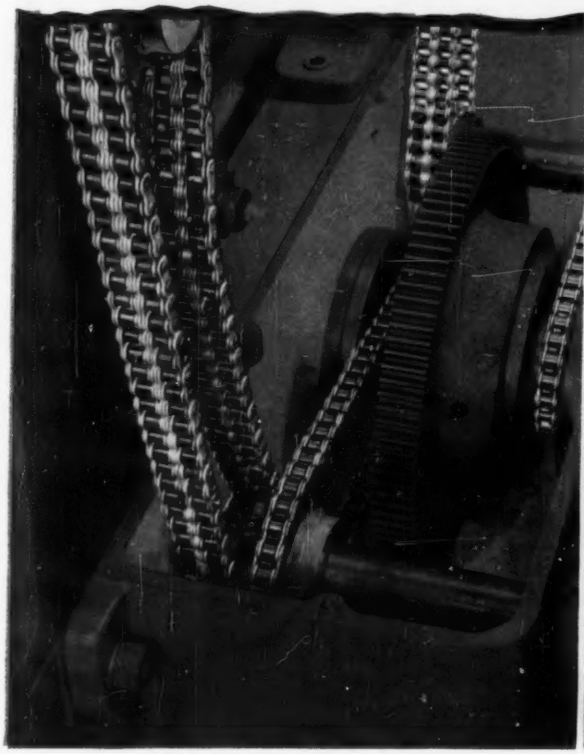
YOU CAN BE SURE...IF IT'S

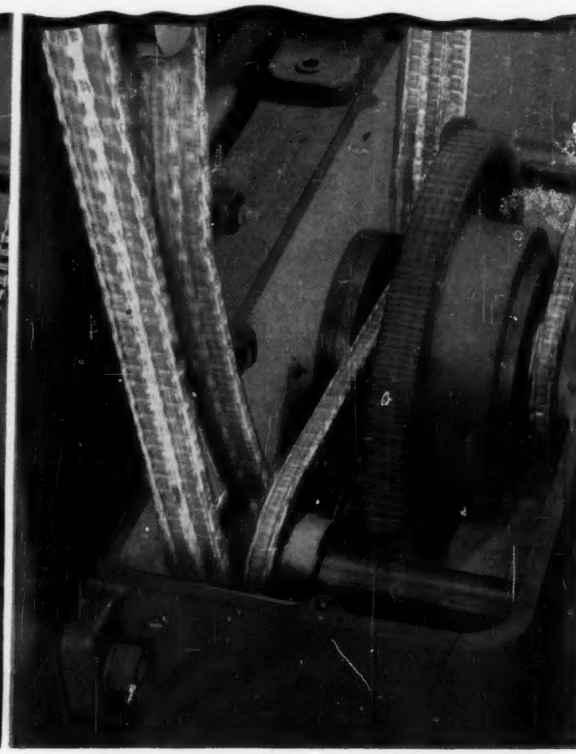
Westinghouse





To static strength . . . add *dynamic strength*





RESISTANCE TO TENSILE STRESS is achieved with properly heat-treated, accurately machined side bars made of premium steel and fitted with properly hardened pins, bushings, rollers.

STRENGTH OF CHAIN IN MOTION results from such refinements as pitch-hole preparation, micro-finish of parts, special processing of side bars, pre-lubrication, rigid quality control.

Why LINK-BELT roller chain takes stresses in stride

On *tough-service* drives and conveyors, Link-Belt precision steel roller chain consistently delivers longer life. That's because its *greater dynamic strength* withstands the starting shock and centrifugal loads of severe operation.

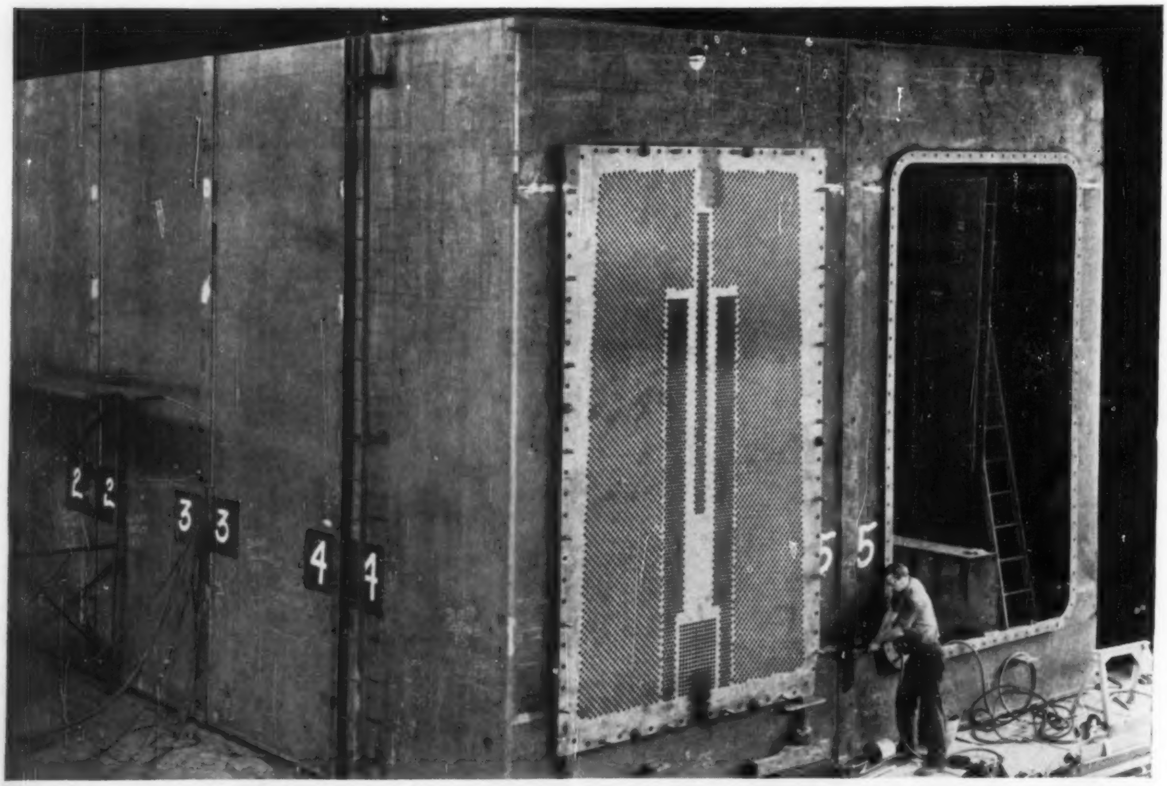
Reports from users prove the effectiveness of Link-Belt's manufacturing extras that add to greater dynamic strength. Shot-peened rollers give greater fatigue life and ability to withstand impact . . . lock-type bushings end a common cause of chain stiffness . . . pre-stressing provides uniform load distribution . . . closer heat-treat control insures uniformity.

For facts, see your nearby Link-Belt office or authorized stock-carrying distributor. 14,643

LINK-BELT

ROLLER CHAIN AND SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N. S. W.; South Africa, Springs. Representatives Throughout the World.

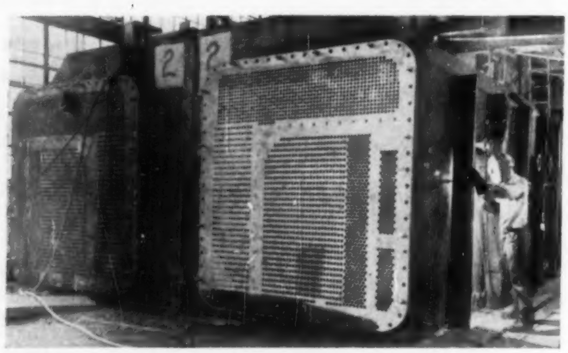


HERE'S ONE SHELL of this twin-shell, triple-lane unit just before shipment to Consolidated Edison's Astoria Station. It's designed to condense 1,600,000 lbs. steam/hr. at 1.87" Hg., with 244,000 gpm circulating water, and has 27,450 aluminum-brass tubes. Unit serves 335,000 kw turbine.

HUGE, SINGLE-PASS, 187,000 sq. ft. CONDENSER

...designed and built by C. H. Wheeler is now being installed at world's largest metropolitan utility

VICE-PRESIDENTS LEE YETTER and Roy Droescher, and Chief Engineer Paul Hamm are responsible for the design and construction of all Wheeler condensers. They work with engineers employed by C. H. Wheeler's customers, with turbine manufacturers' engineers and consulting engineers in BTU chasing.

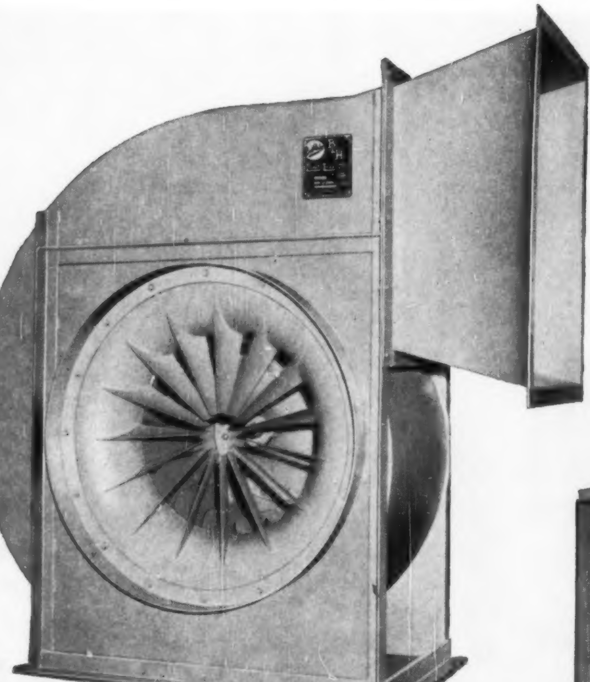


TYPICAL REVERSE FLOW CONDENSER is this 35,000 sq. ft. unit for a Southern electric utility. Patented Reverse Flow feature permits flushing debris from tubes with only slight (and momentary) vacuum loss. Note low height to save head room, rectangular cross section to further utilize space for this Wheeler client.

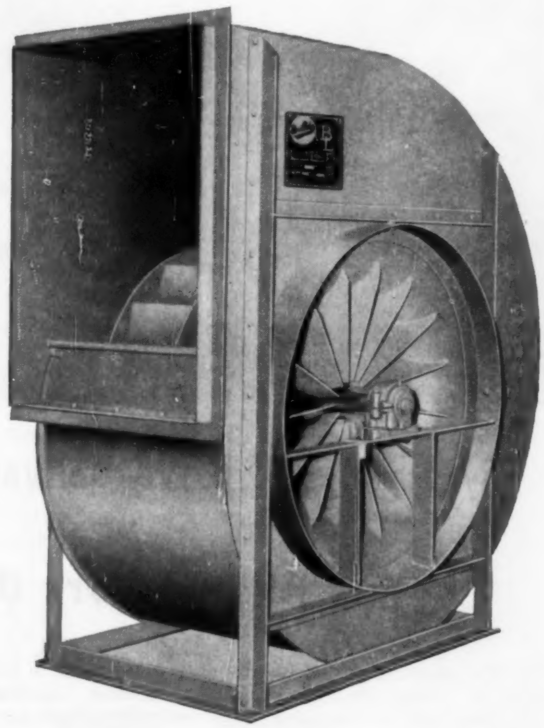
C. H. Wheeler Mfg. Co.

19TH & LEHIGH AVENUE
PHILADELPHIA 32, PA.

Steam Condensers • Vacuum Equipment • Centrifugal, Axial & Mixed Flow Pumps • Marine Auxiliary Machinery • Nuclear Products



WHY COMPROMISE?



THESE FANS LET YOU MATCH CENTRAL SYSTEM FAN SPECIFICATIONS EXACTLY!

"BUFFALO" TYPE "BLH" FOR HIGH PRESSURES

No need to sacrifice performance on high-pressure conduit systems for lack of a fan with the proper characteristics — the "Buffalo" Type "BLH" Fan was designed specifically for Classes II-IV, or pressures of 3¾" and above. Mechanical efficiency is 86% over a broad operating range, with stability of performance from free delivery to shutoff. The smooth inlet bell — directional inlet vanes — backward curve blades — and the divergent outlet — minimize all sources of turbulence to provide unusually quiet operation. Write for Bulletin F-200 and check the all-important "Q" Factor* built into these efficient high-pressure fans.

"BUFFALO" TYPE "BL" FOR MODERATE PRESSURES

This quiet, superbly performing fan has proved its efficiency on many of the largest ventilating and air conditioning installations. Like the "BLH", it is non-overloading, and has "Q" Factor* features such as the smoothly curved inlet bell with directional inlet vanes to guide the air into the wheel with absolute minimum turbulence — the vibrationless, factory-balanced wheel with backward curved blades — the "wheel-suited" housing with ample, properly shaped scroll. For optimum performance and satisfaction on your systems up to 3¾" pressure, your ideal choice is the Type "BL" Limit-Load® Fan. Write for Bulletin F-102.

***The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.**

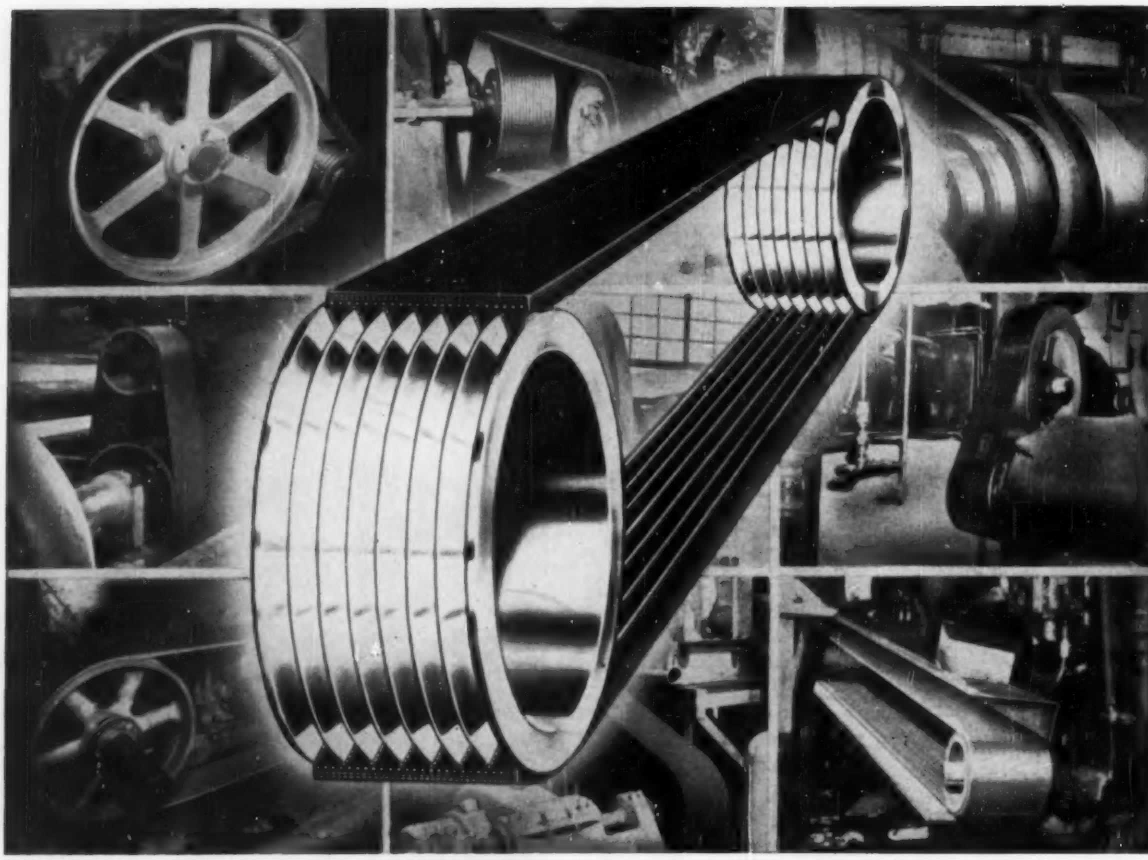
"Buffalo"

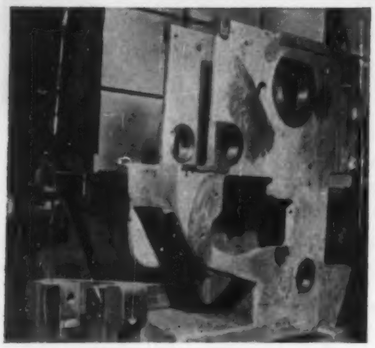
BUFFALO FORGE COMPANY

BUFFALO, N. Y.

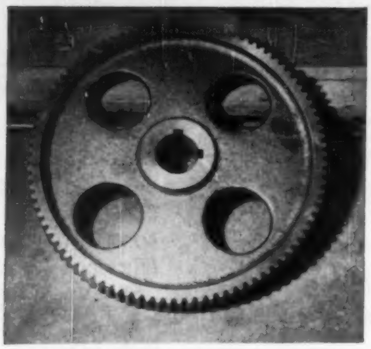
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

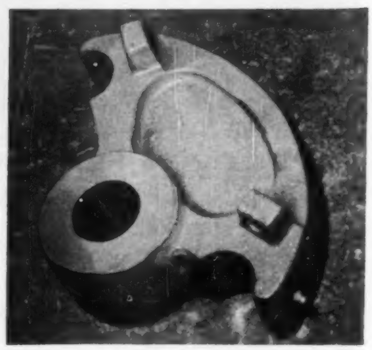




Cast frames with tensiles up to 200,000... eliminate flame cutting of rolled sheet steel.



Cast gears that Brinnel to 475... that withstand heavy loading even with ordinary lubricants.



Machine bearing surfaces right in the castings... eliminate bushings, without sacrificing service.

Build machines like this for less money ...the ductile iron way

Wakefield, Inc., of Salt Lake City, Utah, makes 95% of the cast parts for their "Iron Worker" portable mechanical press of ductile iron.

With ductile iron, they benefit two ways. First, they get the *process* economies of cast iron – good castability, machinability, moderate cost. Second, they gain many of the product advantages of steel – tensile strength of 73,000 to 80,000 psi, yield strength of 63,000 to 67,000 psi, good elastic modulus, excellent impact resistance. In addition, they get the excellent wear resistance of cast iron. Castings are supplied by Backman Foundry, licensed producers of ductile iron.

For more information about ductile iron castings, write for new 28-page Inco bulletin, "Ductile Iron Digest."

THE INTERNATIONAL NICKEL CO., INC.
67 Wall Street New York 5, N. Y.

ductile iron...the cast iron that can be twisted and bent.

MECHANICAL ENGINEERING

VOLUME 80 • NUMBER 1 • JANUARY, 1958

Behind the Cover

BEHIND a newly designed cover, MECHANICAL ENGINEERING this month initiates various changes in a program to keep the magazine up to date. For one thing, the complete contents page has been relocated. And a different system of pagination also goes into effect.

In fact, during 1957, we have been busy revamping the editorial content and styling of MECHANICAL ENGINEERING.

Editorially, we are condensing, rewriting, and, in many cases, combining related ASME papers for the features to make them easier and faster to read.

Hand in hand with this editorial treatment is the method of presentation—the styling or format. Hence layout of the pages has also undergone considerable change during the past few months. Through the use of new typography techniques, we have been employing different type faces for feature article titles. In addition, we have attempted to make the magazine more attractive, dramatic, and inventive in keeping with the latest magazine format practices.

These changes, of course, are not being instituted arbitrarily. Careful studies and surveys have been made—all indicating that ASME members would like to see a livelier, more attractive, and easier-to-read magazine.

For example, the Society has employed the Eastman Research Organization, a leading editorial research agency, to analyze the reading patterns of ASME members. In a series of personal interviews, a fair sample of reader reaction is checked page by page in an attempt to define his interest in a particular issue—what he read and how he read it—and the value, benefit, or satisfaction he derived from his reading of each particular item.

The Eastman service was initially contracted for in October, 1953, and has been extended to the February, 1954, October, 1956, April, 1957, and September, 1957, issues of MECHANICAL ENGINEERING.

The Eastman reports have allowed the editorial staff to take a good hard look at MECHANICAL ENGINEERING as to both content and format.

It has enabled the editors to study these surveyed issues page by page and section by section. Many of the comments by members in these Eastman interviews have confirmed our thinking about a number of items and changed our views on a number of others.

As a result, with this January issue, numerous changes go into effect. The cover has been completely redesigned to combine a photo with an abbreviated list of contents. Another major change is the placing of the complete contents in the front of the book on pages 3 and 5—two pages. The old system of numbering the advertising and editorial pages separately is also being abandoned. Beginning this month, pages of each issue will be numbered consecutively starting with page 1 and continuing through to the last page including both the editorial and advertising sections. Next month's issue will also start with page 1, and so on throughout the year.

During the year, further changes will be made in a continuing effort to improve MECHANICAL ENGINEERING and increase its usefulness.

To members who have been interviewed by Eastman representatives, we give our heartfelt thanks. From others, who may in the future find an Eastman representative knocking on his door, we hope to receive additional helpful comments.—*J. J. Jaklitsch, Jr.*

Editor, J. J. JAKLITSCH, JR.

Editor Emeritus, GEORGE A. STETSON

RETIRES.....
as ASME Secretary

C. E. DAVIES

Clarence E. Davies, who retired as Secretary of ASME on Dec. 2, 1957, became Secretary of ASME in 1934 during a period when the Society was suffering from the impact of one of the most devastating economic disorders of modern times. In spite of the discouraging situation which he faced when he was elected Secretary in 1934, Davies ably and energetically maintained the ideals and policies established by his distinguished predecessors and vastly expanded the activities and influence of the Society.

Davies' retirement, however, will not rob the engineering profession of his services and talents. Beginning this month, he will devote full time to his new position as Building Co-ordinator for the new United Engineering Center.

He obtained his engineering education at Rensselaer Polytechnic Institute (1914) under such men as Palmer C. Ricketts and Arthur M. Greene, Jr., and engineering training and experience in manufacturing and management under John H. Barr, Fred J. Miller, and Henry L. Gantt.

Prior to joining the Society, Davies began his professional career in the production department of the Smith Premier Works of the Remington Typewriter Company in Syracuse, N. Y.

During World War I, as first lieutenant and later as captain, Davies served in the Ordnance Department, U. S. Army, being assigned to the Frankford Arsenal.

When the United States entered World War II he was called to active duty, with the rank of Colonel, in the Ordnance Department as chief of the Control Division, office of the Chief of Ordnance, in which capacity he was concerned with problems of policy, organization, methods, procedures, and statistical reporting practices for the Ordnance Department. For his service he was awarded the Legion of Merit.

Davies' apprenticeship in ASME began in the editorial department in 1920 as associate editor. In 1921 he became managing editor and assistant secretary of the Society. But the wealth and boldness of his ideas, which he put into effect with imagination, energy, persistence, enthusiasm, and forceful leadership, soon marked him for enlarged responsibilities. He took over the staff work on meetings and programs, assisted Society planning committees devoted to aims, objectives, scope, and organization; familiarized himself with all details of Society operation; took a leading part in the organization of the Professional Divisions; and was the point of contact between the Secretary's office and numerous Society committees and joint activities. In 1931, he was appointed executive secretary and assumed a large portion of the administrative burden of the Secretary's office. On the death of Calvin W. Rice in 1934, Davies was appointed to be his successor.

Here are a few of the many examples of Davies' energetic leadership in ASME and related affairs.

- As secretary of the ASME Meetings and Program Committee he administered with meticulous attention to details the impressive ceremonies that marked the 50th Anniversary of the Society in 1930.
- He had the courage and foresight to induce the Society to publish the *Journal of Applied Mechanics* and *Applied Mechanics Reviews*, thus making ASME a world leader in that field.
- He was active in the formative stages of the Engineers' Council for Professional Development and has been closely associated with its progress ever since.
- When the American Engineering Council disbanded, he took the lead in organizing a group of presidents and secretaries of the Founder Societies which later developed into Engineers Joint Council.
- In Western Europe, England, and Canada he is a well-known figure at conferences dealing with engineering and professional subjects, as representative of the Society and EJC.

Davies, in war as in peace, has directed his engineering ability toward forwarding the security and welfare of the nation. His personal energy and vision have been an important factor in the growth of our Society and in the expansion of its scientific service to the engineering profession and to engineering education during that time. One of his great elements of success was his tact in cooperating with other societies on the broad aspects of national and industrial situations. As the dynamic director of our Society—he has made an outstanding contribution to the development of engineering science.

He has been a great Secretary!

APPOINTED.....
ASME Secretary

O. B. SCHIER, II

THE MAN appointed to the ASME Secretaryship is a familiar figure in Society activities. He is O. B. Schier, II, a member of the ASME staff since 1946. On his shoulders is placed squarely the leadership so vigorously exercised by his predecessors.

Schier, who picked up the reins during the 1957 Annual Meeting, thus faces tremendous challenges both inside and outside of ASME. Within the Society, a tremendous growth in membership and services has been under way. For example, since Schier joined the ASME staff the membership has more than doubled to 44,000 members plus 13,000 student members. And the curve is on the upswing. This means that more and more engineers will look to ASME for professional and technological leadership.

Outside of ASME, Schier, in his new capacity, faces a world that is dizzy with a technological fever—a fever complicated by Russia's current spurt in taking the lead in science and engineering. How long the Russians will remain ahead in this race will depend, of course, not only on ASME, but on the co-operative and co-ordinated action to be taken by the Society in conjunction with other engineering societies throughout the free world, with governments, with industry, with educational facilities. Toward this end Schier inherits a rich background of co-operative effort on the part of ASME—especially its co-operation with other engineering and technical societies and with governmental agencies and industry on engineering matters. ASME stands for co-operation!

As a member of the ASME staff, Schier was first appointed secretary to the Professional Divisions Committee. Later he became Meetings Manager and took over the task of organizing and operating national meetings and division conferences. He played an important part in setting up the Society's procedure to make available to members pamphlet copies of technical papers which are to be presented at meetings and conferences. He called it "Papers Control."

In 1953, he assumed the duties of Field Manager in addition to his former duties as Meetings Manager. As Field Manager he served the eight vice-presidents in their regional responsibilities. He also served the Membership Development and Admissions Committees.

In November, 1953, he was appointed Assistant Secretary and in January, 1956, was placed in charge of Field Service where he continued to serve the vice-presidents and, in addition, the Board on Membership, Board on Public Affairs, Board on Honors, Civic Affairs Committee, National Junior Committee, Engineers Registration Committee, Committee for Professional Practice of Consulting Engineering, and the Old Guard Committee of the Society; Engineers Joint Council; and the Engineering Societies Personnel Service, Inc.

Schier was instrumental in implementing the revised ASME Student Member Program which went into effect in the fall of 1956.

Gifted with a friendly personality, sound judgment, initiative, originality of thought, ability to organize, and the ability and desire to co-operate with others, Schier's qualities were recognized when he was appointed Deputy Secretary during the 1956 Annual Meeting.

His activities with the Society, particularly in connection with the Publications Committee and the Metropolitan Section, date back to the early 1930's.

A native of Baltimore, Md., he received his early education at the Baltimore Polytechnic Institute. In 1929, he was graduated from Lehigh University with the degree of ME, and he received the degree of MS from the same institution in 1931. From 1931 to 1937 he served progressively with the Brooklyn Edison Company as junior engineer, cadet engineer, assistant inventory supervisor, and assistant engineer; and from 1937 to 1941, with the Consolidated Edison Company of New York, Inc., as assistant engineer.

In 1941, Schier became associated with the War Production Board, Production Service Division, New York, N. Y. As a member of the U. S. Naval Reserve, he was attached to the Industry Co-operation Division, Office of Procurement and Materiel, Chicago, Ill., from 1943 until his discharge as a lieutenant in 1946.

A resident of Huntington, L. I., N. Y., Schier, who is 49 years old, is married and has a daughter.

Thus, armed with a rich background of experience in industry, in military service, and in Society affairs and activities, Schier has forcibly demonstrated his ability to take on this new and important position.

He will be a great Secretary!

Interlock circuits and sequential operations, difficult to describe in words, are relatively simple to impart in logic-diagram form. Here, mathematical-logic technique is applied to the automatic batch production of chemicals, a method of specifying how controls shall operate.

DESIGN BY LOGIC

Automatic Chemical Batching

By J. P. Laird, Mem. ASME

Engineering Service Division, E. I. du Pont de Nemours & Company, Wilmington, Del.

In the design and use of automatic sequence controls and interlocks, there have been serious difficulties in communication among technical personnel. Written descriptions are frequently vague or confusing.

The techniques described here employ the principles of Boolean algebra (first published by George Boole in 1847). Boolean algebra is a branch of mathematical logic which deals with statements which are true or false, and with conditions which exist or do not exist. Pictorial representations of logical relationships, and the graphical manipulations of these relationships, provide powerful tools for the synthesis and analysis of interlock systems, sequential control functions, and such other systems as organizational functions and legal contracts.

System requirements specified in logic form can be translated into arrangements of hardware and directions for operation. Conversely, a real system can be described in logic form, and its true nature analyzed. Thus the logic descriptions of requirements and of performance can be compared to make sure there are no discrepancies.

Chemical Process Controls

To realize satisfactory control over an automatic batch plant, several factors must be taken into account.

Switchover to manual control of a batch plant must be possible, regardless of the nature of the automatic controls. If such features are not designed in initially, maintenance and trouble shooting on both the process and the controls are quite awkward.

There must never be any conflict or ambiguity as to which agency is co-ordinating the control of the process—the operator or the automatic sequence controls. This problem can usually be solved by providing a master selector switch having "manual," "off," and "automatic" positions.

Alarms must usually be provided to warn the operator of unusual conditions which require his attention. Some of these alarms must be active at all times, while others may be operable only at certain steps in the sequence.

Interlocks prevent unfavorable combinations from occurring. For example, a level switch which indicates when a tank is full, should, when activated, prevent the opening of any valves in lines which feed materials into the tank, regardless of the source of the signals to the valves. Interlocks are usually required to prevent the operator from inadvertently fouling the process or creating a hazard.

Boolean Algebra

To inspect these problems from the viewpoint of Boolean algebra, consider a variable x to represent the entire statement "valve x is open." The statement must be either true or false.

If the statement is true, $x = 1$

If the statement is false, $x = 0$

Contributed by the Process Industries Division and presented at the Annual Meeting, New York, N. Y., Dec. 1–6, 1957, of The American Society of Mechanical Engineers. ASME Paper No. 57—A-151.

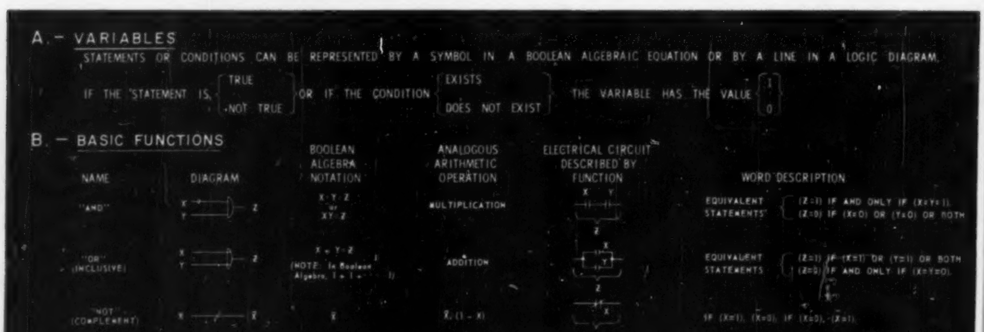


Fig. 1 Symbolism and nomenclature used in the language of mathematical logic. With these symbols, verbal statements conceived in the mind of the engineer, or hammered out in conference, can be given objective pictorial representation.

Therefore the value of a logic variable at any instant can only be 0 or 1.

If the original statement, "valve x is open," is false, then the opposite statement, or complement, must be true. The complement of a variable x is written $\bar{x}$ and is described as "not-x." This function allows us to start with positive statements which are easily understood and specify what will result if they are not true.

There are two primary logic functions, "and" and "or." These functions are best illustrated by a set of electrical switches connected in series or in parallel. Switches in series must all be closed before the over-all circuit is closed; the first switch "and" the second switch "and" . . . in order to close the circuit. For switches in parallel, one or more contacts being closed creates a closed circuit; the first switch "or" the second switch "or" . . . "or" any two switches . . . "or" all switches, if closed, will create a closed circuit.

Fig. 1 at B illustrates the three basic logic functions. The pictorial representation of "and" shows that the output will be 0 except when every input has the value 1. In other words, one input variable having a value 0 at a given instant keeps the output at a value of 0.

The "or" function, on the other hand, shows that each and every input has broken through the barrier and any input which has a value of 1 will cause a value of 1 at the output. These relationships express instantaneous conditions; there is no delay of any kind between input and output for the relationships shown at B of Fig. 1.

The special functions of time, shown at C of Fig. 1, are necessary for defining the operation of actual systems involving signal delays, timed intervals, or finite reaction times. The special pictorial representations shown at D describe selective operations which would otherwise involve complex arrangements of the three basic functions.

The Logic Diagram

Fig. 2 shows theorems and postulates of Boolean algebra in diagrammatic and algebraic form. The pictorial representations can be manipulated, combined, or expanded as shown, in accordance with the same rules which govern the way in which the algebraic equations are manipulated.

In Fig. 3 at D are shown combinations which usually indicate that an error has been made. Consider the following example. Let us suppose that operating personnel require that pressure (y) in a vessel is required before a signal (x) can cause a pump to operate. Also, suppose that consideration of the nature of the process shows that the pump must run in order to generate the required pressure. Such a system cannot be started, and the information takes the form shown at D–2a of Fig. 3.

Figs. 1, 2, and 3 provide the tools with which a person can record the true nature of a logical argument or a set of requirements. They also provide the means for manipulating the relationships without altering their meaning. In addition, Fig. 3 provides a few of the caution signs which indicate that fundamental errors have entered the picture.

The Sequence Chart

Fig. 4 shows typical basic data for an automatic batch process. The information pertains to a portion of a hypothetical process which might be described as follows:

The flows of materials into a batch vessel are to be co-ordinated. The flows of materials Nos. 1, 2, and 3 into a header leading to the vessel are regulated by flow-controlled valves Nos. 1, 2, and 3, respectively. Materials 1 and 2 must never contact each other except in the vessel. Material 2 cannot be used by itself, but must be used in the presence of material 3. These conditions give rise to a sequence of steps, Nos. 1 through 5, during which the vessel is made ready for the addition of material 2. Steps 6 through 11 involve the actual addition of material 2. Steps 12 through 22 involve further processing of the batch.

The sequence chart shows which valves will be commanded to permit flow at the controlled rate (black bar) or to close (absence of black bar) at each step in the sequence. In addition, it shows at each step what conditions must be met in order for the sequence to continue on to the next step. This is referred to as a "proceed" signal. This method of control provides check-back on the process and, hence, insures that all parts of the process are operating.

The sequence chart is significant because it can be used in conference to record decisions about the details of the process steps. It provides a quick, orderly means of eliciting and recording important information which would otherwise be undisclosed or at best confused by wordy descriptions. Later, this same information is reproduced on the operator's control panel to act like a road map or automatic check list showing the progress of the sequential operation. If troubles develop, the operator can see at a glance where he has been, where he is, and where he should be headed. Fig. 5 shows the logic diagram for the system control.

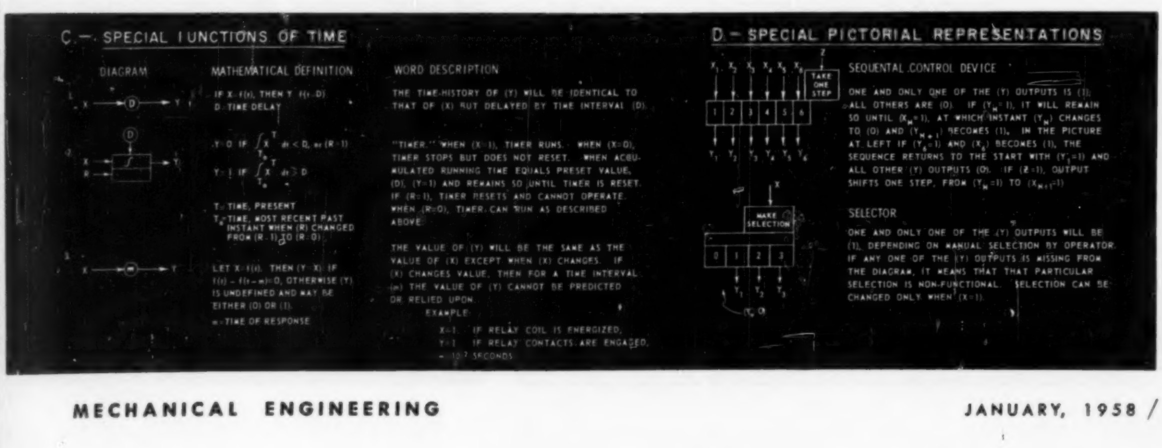


Fig. 6 shows the logic diagram of alarm requirements. It shows that, if the alarm is actuated, a horn will sound and the alarm light for that circuit will flash red. If the "acknowledge" button is pressed, the horn will stop and the red light will be on steadily. If the measured variable is back within the safe range and the acknowledge button has been pushed, then, and only then, can the alarm system be reset by pressing the "reset" button.

In the same manner, a logic diagram can be drawn showing how a telephone-type, spring-driven stepping switch can be controlled so as to execute the function defined in Fig. 1 at D–1.

There are many wiring combinations—and even complete magnetic and transistorized systems of control—which could translate the logic diagram into machinery. The method is easy to engineer, easy to troubleshoot, and easy to modify if process requirements should change.

Regardless of what control system is used, it is desirable to derive logic diagrams from the wiring diagrams, simplify them, and compare them with the original system requirements. When checking the design in this manner, it is important to include the response-time operator shown in Fig. 1 at C–3. This may avoid problems of sneak circuits or critical races.

Control Panel

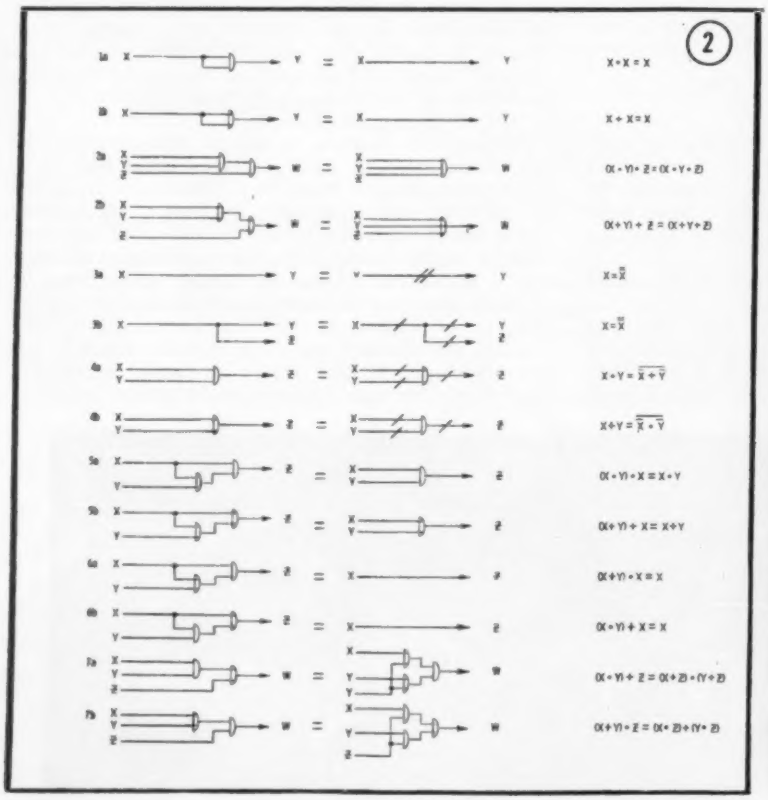
A typical control panel for automatic sequence control may have sequence lights showing at what step the process is operating, or, if the selector switch is in the "manual" position, at what step the process would operate if the selector were changed to "automatic." Device lights turn on when a field-located device is actuated.

Special features may be provided for use with manual control, such as a "push-to-step" button, to cause the sequence to progress one step as indicated by the sequence lights. Automatic sequencing and control features of the system would be inoperative with the selector at manual. The operator could, therefore, turn on the proper sequence light by using the push-to-step button and then initiate automatic operation.

Many processes make use of timers at various steps. It is desirable, when on manual control, to be able to run or reset the timer associated with a given step. A switch and push button are provided for this purpose.

Conclusion

Interlock circuits and sequential operations are difficult to describe in words, yet relatively simple to describe completely in logic-diagram form. If the description of a system, as stated by engineers, includes statements which are self-contradictory or if the description is inadequate to describe a complete system, this fact will be apparent from the logic diagram or can be shown up by analysis. Thus an orderly, consistent, and complete statement can be made in logic language of the objectives and known facts concerning a specific system. These logic techniques are helpful in resolving differences in opinion and in preserving basic philosophies and points of view.



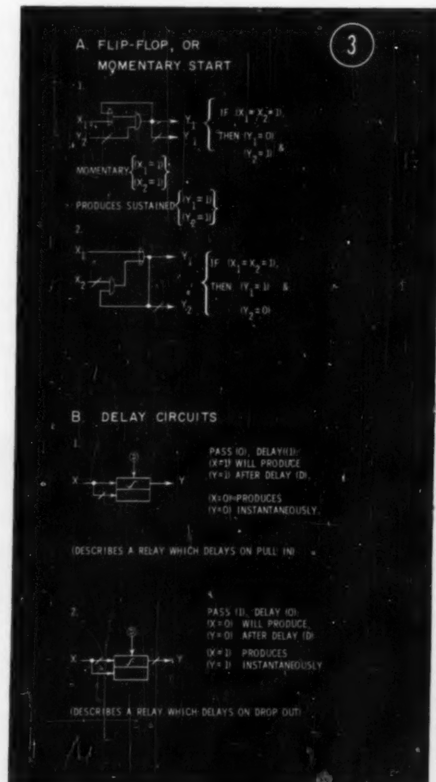


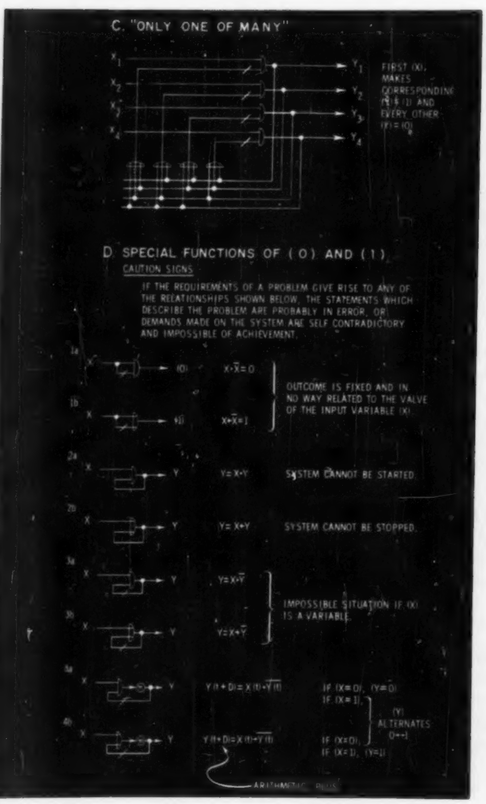
Fig. 2 Postulates and theorems of Boolean algebra. The diagrammatic form is usually easier to construct and interpret if the information to be recorded is dependent on past history or the sequence in which events occur.

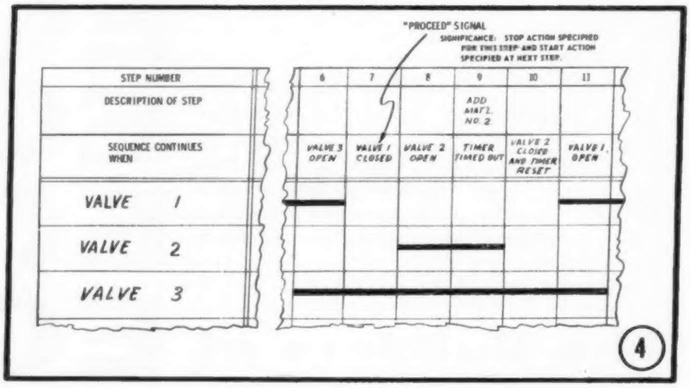
Fig. 3 Some frequently encountered logic combinations. At A, B, and C are typical combinations of the basic building blocks. Relationships can be manipulated without altering their meaning.

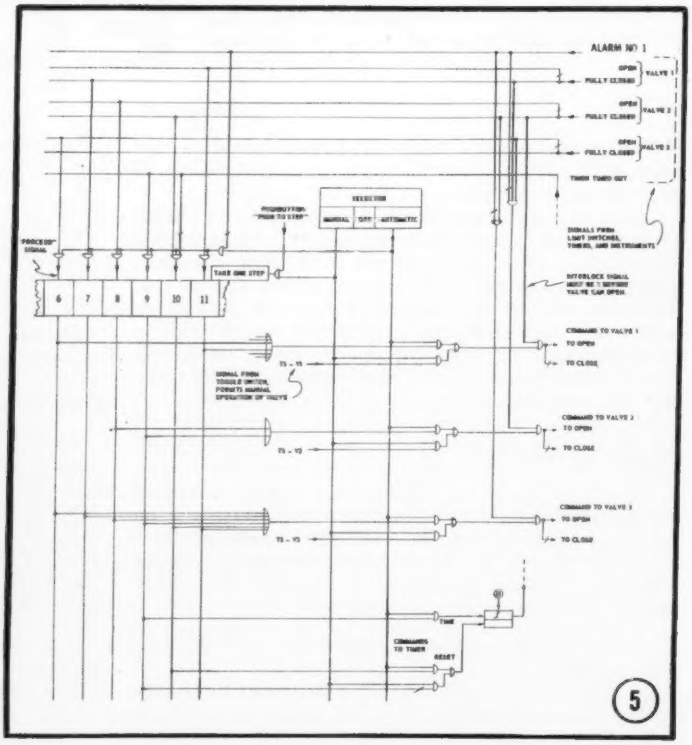
Fig. 4 Typical basic data for an automatic batch process: A portion of a sequence chart. With the chart goes this verbal description of interlock and alarm requirements: Valve 2 shall not open unless valve 1 is closed and valve 3 is open; if measurement "z" ever is higher than safe maximum value, alarm No. 1 shall sound, and valves 2 and 3 shall automatically close. Alarm shall have "acknowledge" (horn silencer) and "reset" push buttons. Alarm No. 1 shall prevent sequence from continuing.

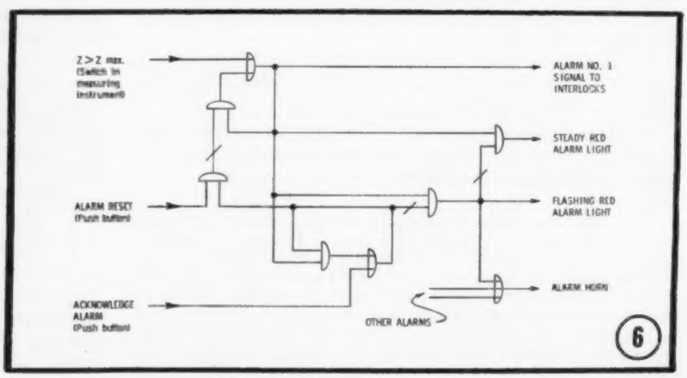
Fig. 5 Logic diagram for the system control, with interlock requirements shown in pictorial form. No valve can open unless the associated interlock signal is 1. The diagram shows what information is required and in what logical combination before any valve, pump, or other mechanism can be operated.

Fig. 6 Logic diagram of alarm requirements. Comparison of this pictorial statement with the verbal statement about the alarm given under Fig. 4 will indicate that the word statement was not adequate. The logic diagram permits exact definition.









It took men with vision and creative power to conceive and evolve the Engineers' Council for Professional Development, an important instrument now serving the engineering profession. It also took years of dedicated work.

ECPD

ECPD

ECPD

The Builders of ECPD

ECPD

By C. E. Davies,[1] Fellow ASME
Secretary, 1934—1957
The American Society of Mechanical Engineers

The formation of ECPD in the fall of 1932 resulted from the impact of two chains of events under way within the engineering profession.

In the year 1922, one chain of events started at SPEE (forerunner of today's American Society for Engineering Education). The initial impetus came when Charles F. Scott, in his presidential address, asked: "What can SPEE do to develop, broaden, and enrich engineering education?" A board of Investigation and Co-ordination was appointed with Scott as chairman. Funds were secured, and William E. Wickenden was appointed director in November, 1923.

Growth of the Idea

In succeeding years, Wickenden's reports contained recommendations for bringing together the educators, the profession, and industry in a coherent scheme of educational development. In 1927, speaking at the Annual Meeting of ASME, he defined his concept in the following ten points:

1 Act jointly—pool your interest with sister societies and colleges.

2 Take active measures to guide American youth in its consideration of careers.

3 Create a joint accrediting agency for colleges of engineering.

4 Re-examine and, if practicable, codify your rules of admission to membership.

5 Through student branches educate students in the history, traditions, ethics, and social functions of the engineering profession.

6 Create joint sanctions for the award of professional degrees, and relate them to terms of admission to professional grades of membership.

7 Take a large share in directing the after-college education of young engineers.

8 Certificate the educational and professional attainments of engineers within the profession.

9 Take measures to create other credentials of educational attainment in addition to college degrees.

10 Do your part, through joint agencies, to promote the corporate welfare of engineering education.

The substance of these ten points appeared later in the concept of ECPD.

Impact of ASME

Another chain of events started at the 1927 ASME Annual Meeting. A question raised in the business session about the inequity of engineers' compensation compared to that of other professions led to the establishment of a committee on the Economic Status of the Engineer with Conrad Lauer as chairman. Wickenden was a member, as were Clarence F. Hirshfeld, Dexter S. Kimball, Harry Oatley, James M. Todd, W. A. Starrett, and Herbert L. Whittemore.

The resulting 1930 Survey of Earnings of Mechanical Engineers was published in September, 1931. Elliott Dunlap Smith of Yale served as survey director, and Hudson Hastings, also of Yale, prepared the statistical tabulations.

The Committee interpreted its task as broader than earnings, and included in its function "the suggesting of ways and means for broadening and deepening the engineer's life with a view to improving his status professionally and socially."

Accordingly, in October, 1931, this Committee and the ASME Committee on Registration recommended to the ASME Council a joint program for upbuilding engineering as a profession. The report entitled "Certification Into the Profession" contained these five points:

1 Act jointly.

2 Take active measures to guide youth in its consideration of careers.

3 Co-operate actively in the educational process: Establish joint accredited agency for colleges of engineering.

4 Direct the after-college training.

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[1] Mr. Davies retired as Secretary of ASME on Dec. 2, 1957, after nearly thirty-eight years on the ASME staff and twenty-three years as the Secretary. He carried the administrative responsibility for, and was intimately associated with, the preliminary steps taken by ASME which resulted in the establishment of ECPD in 1932. He served ECPD as its Secretary for the first two years.

Condensed from an address at the 25th Anniversary ECPD banquet during the EJC-ECPD Joint Assembly, Oct. 24–25, 1957, New York, N. Y.

5 Certificate the educational and professional attainments of engineers within the profession.

The October recommendations were approved by the ASME Council early in December, 1931, and invitations authorized to other societies to undertake joint action. From then on, events moved rapidly.

Conference on Certification

On Feb. 3, 1932, the Conference on Certification into the Profession was convened by Conrad N. Lauer, then ASME President. C. F. Hirshfeld was selected as chairman, and C. E. Davies as secretary. The joint program suggested by ASME was approved in principle: NCSBEE and AIChE were invited to join ASCE, AIME, ASME, AIEE, and SPEE, and a planning committee was appointed with General Robert I. Rees as chairman.

On April 14, 1932, with seven societies represented, the Conference adopted the report of the Planning Committee entitled, "The Development of the Engineer—A Program for Joint Action," and voted to establish the Engineers' Council for Professsonal Development to carry out the program.

A temporary organization of ECPD was formed by seven societies on Oct. 3, 1932. C. F. Hirshfeld was selected interim chairman, and C. E. Davies interim secretary. The interim Executive Committee was made up of J. Vipond Davies, Donald F. Irvin, William E. Wickenden, Charles F. Scott, H. C. Parmelee, R. I. Rees, and D. B. Steinman, with the interim chairman and secretary. A Charter and Rules of Procedure were completed on March 13, 1933, and referred to the participating bodies for ratification.

Four standing committees were completely organized in May, 1933. By the time of the first annual meeting, on Oct. 10, 1933, six of the bodies had approved the Charter, and the seventh did so ten days later.

The 1933 Charter was short. It described ECPD as a co-operative conference of bodies representing the professional, technical, and legislative phases of education and practice, and greater solidarity of the profession. Its immediate objective was the development of a system whereby the progress of the young engineer toward professional standing can be recognized by the public, the profession, and the man himself. The four-point program included:

1 Means to assure entrance to the profession by young men who have the necessary aptitude and capacity.

2 Criteria for colleges of engineering to insure graduates a sound educational foundation.

3 Plans for the further development of graduates.

4 Methods of recognizing engineers who have met suitable standards.

The Charter further provided that ECPD would administer procedures approved by the boards of the participating societies, and stipulated that Charter changes require the approval of two thirds of the boards.

Leadership

The achievements of 25 years may be visualized in terms of the men who guided ECPD's progress. During the formative years, Clarence Hirshfeld provided calm leadership, inspired by his conviction of the importance of ECPD as an influence on future generations of engineers. Robert L. Sackett, then dean of Penn State, chaired the Committee on Student Selection and Guidance for ten years. He was succeeded by Allen Cullimore. Karl T. Compton gave the accrediting program its impetus, while S. C. Hollister, Thorndike Saville, and Harold Hazen gave devoted attention to the critical problems arising out of specialization in engineering education. In later years, Harry Hammond laid the program for accrediting technical institutes.

Charles F. Scott—whose speech to the SPEE in 1922 sparked the first investigation—served three years as chairman of ECPD, and for six years was chairman of the Recognition Committee. J. P. H. Perry, chairman for two years, brought the point of view of the practicing engineer to the work of ECPD. During Mr. Perry's term, the Engineering Institute of Canada became a member body. Robert E. Doherty was chairman for three years during World War II.

Other chairmen whose vision and influence have sustained ECPD are Everett S. Lee, James W. Parker, Harry S. Rogers, L. F. Grant, and Thorndike Saville.

Summary

The Charter of ECPD today, not different in principle from the 1932 document, still incorporates the concept of a co-operative body with a unified program, much as stated by Wickenden in 1927 and in the 1931 plan for joint action. In 1951, the Charter was clarified, made more specific, and a provision added to the program encouraging co-operation among practitioners, educators, and students to maintain high educational standards.

In its twenty-five years on a minimum annual budget, ECPD has made important progress as a co-operative organization to administer the Wickenden ideal of a coherent unified program of continuous growth for the young engineer. The selection of entrants into engineering through the guidance program, stimulated by the present shortage, is being carried out on a national scale.

The accreditation programs both for the bachelor's degree and the technical institutes are good, and the leaders of the programs are alert to the impact of present and future requirements. In post-college training, two conclusive demonstrations have established the soundness of the program which is now ready for country-wide extension. In the "Faith of the Engineer" and the "Canons of Ethics" ECPD has produced two splendid documents and is busy putting them to useful purpose. ECPD has represented U. S. A. engineering education in discussion with European educators with valuable results assured. ECPD took the lead in supporting a demand for a comprehensive study of the engineering profession.

Closing

Thirty years ago Wickenden charged the organized profession to organize the novitiate of the young engineer into a much more orderly and effective process. That the attempt to round out a professional discipline by setting up ECPD was the answer was established by Dr. David B. Steinman when he reported to the National Council of State Boards of Engineering Examiners in 1932 with the following words: "The Plan of the Engineers' Council for Professional Development is the most constructive and forward-looking program that has ever been presented for advancing the status and recognition of our profession."

STANDARD SIZES OF SHIPPING CONTAINERS FOR CARGO INTERCHANGE

By **Herbert H. Hall**, Mem. ASME, Materials Handling Consulting Engineer, Aluminum Company of America, Pittsburgh, Pa.

Several methods of handling small quantities of freight have evolved which facilitate the growing interchange between carriers. Standardization of shipping-container sizes to promote the most efficient use of space with the rising cost of transportation is of great interest to the shippers and carriers.

Pallets

A committee of the American Standards Association has been studying pallet standardization and has submitted a preliminary recommendation listing ten standard sizes, including several that are particularly suitable for interchange between carriers.

The U. S. Naval Supply Depot at Bayonne, N. J., recently established a practice for determining permissible stacking arrangements for the standard 48 × 40-in. pallet, allowing an overhang of 2 in. on the ends and $1^1/_2$ in. on the sides. This limiting size of 52 × 43 in. was considered 100 per cent utilization of the allowable space, and still left sufficient clearance in 110-in-wide boxcars and 90-in-wide van bodies for some inaccurate stacking and possible leaning of the palletized load.

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Shipping Containers

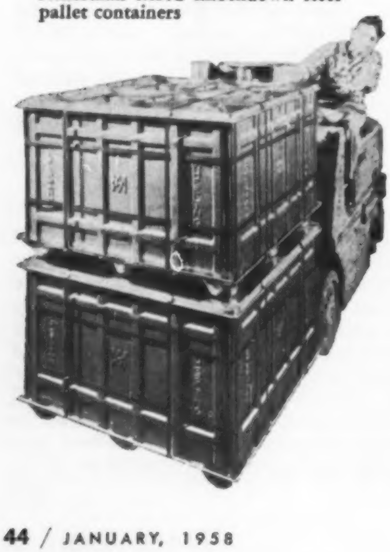
Many shipments of valuable or fragile items, bulk materials, or shipments requiring transfer from one type of carrier to another, justify and frequently require the use of shipping containers. Advantages are:

1 Shipment from points of origin to destination in undisturbed sealed units.
2 Reduction of labor requirements in loading, stowing, and unloading.
3 Substantial reduction of packing-cost and packing-material requirements.
4 Reduction of physical damage and breakage.
5 Reduction of contamination from outside source.
6 Almost total elimination of loss by pilferage.
7 Avoidance of cost and delay for rehandling separate shipments at transfer points and elimination of the chance of mixup or loss of shipments.
8 Minimizes paper work, as detailed shipping lists and in-transit checking are eliminated.
9 Reduces insurance costs because of less pilferage, contamination, breakage, and loss.

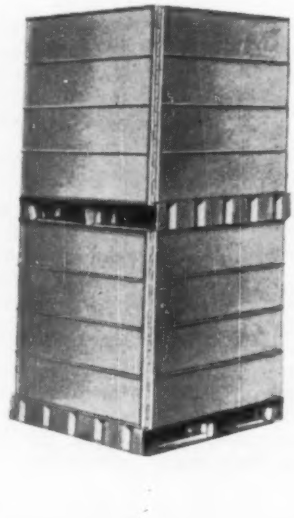
The disadvantages include:

1 Fixed charges based on original cost or rental charge, and maintenance for containers.

Ackerman tiered knockdown steel pallet containers



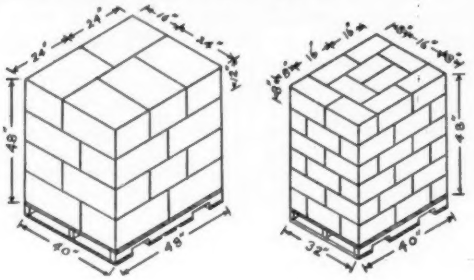
Republic tiered collapsible shop containers



Tiered steel pallet shop containers

UNIT LOADS

Palletized unit loads on standard four-way pallets provide economical use of space for stacking items



2 The paper work involved in keeping account of the containers, such as location, condition, per diem, and repair charges.

3 Additional weight of shipment from the containers. This can be partially offset by packing material savings, and can be minimized with lightweight construction.

Pallet Containers

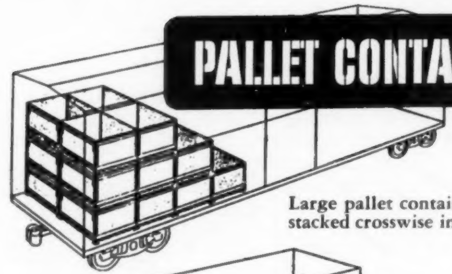
Because they are rigid units, pallet containers can be loaded satisfactorily into boxcars or vans with less clearance than is necessary for a palletized unit load. The amount of clearance required for convenient loading depends on the rigidity of the container and its external surfaces. Four standard sizes of pallet containers suitable for interchange service between highway, railroad, marine, and air carriers have been recommended.

It is reasonable to expect that any of these four sizes of pallet containers can be standardized in four heights to permit efficient stacking in either boxcars or vans and to take maximum advantage of the cubic space.

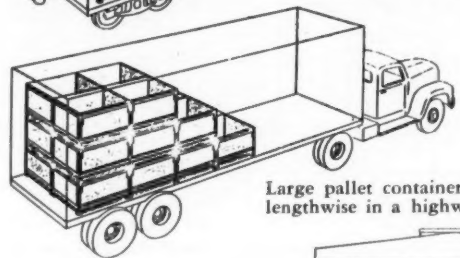
Under certain circumstances, it may be desirable to use relatively small containers that can be nested and assembled into strapped units. Such units can be used interchangeably with standard pallet containers. The Air Force has been experimenting with a similar system.

Castered jumbo basket pallet container

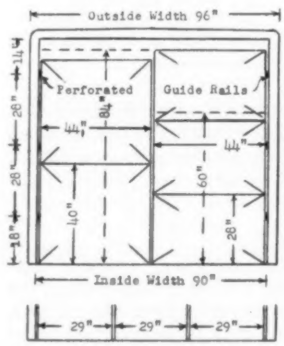
PALLET CONTAINERS



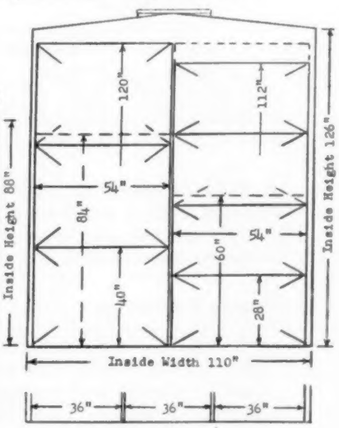
Large pallet containers stacked crosswise in a boxcar



Large pallet containers stacked lengthwise in a highway van



Arrangement of pallet containers in a standard vantainer or van body



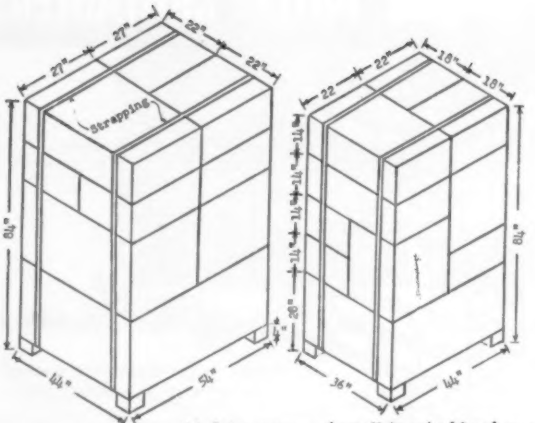
Arrangement of pallet containers in a standard boxcar

TABLE 1

PROPOSED PALLET CONTAINER STANDARD SIZES

DIMENSIONS O.D.	DIMENSIONS I.D.	CAPACITIES Cu.Ft.	CAPACITIES Pallets	CAPACITIES Containers
Small Pallet Containers - 3 wide in Van, 3 wide in Boxcar, 1" wall thickness				
L" x W" x H"	L" x W" x H"		In In	
36 x 29 x 28	34 x 27 x 23	12.2	4-32 x 24	
36 x 29 x 40	34 x 27 x 35	18.6	7-32 x 24	
36 x 29 x 60	34 x 27 x 54	28.6	10-32 x 24	
36 x 29 x 84	34 x 27 x 78	41.4	15-32 x 24	
Medium Pallet Containers-2 wide in Van, 3 wide in Boxcar, 1-1/2" wall thickness				
44 x 36 x 28	41 x 33 x 22.5	17.6	3-40 x 32	
44 x 36 x 40	41 x 33 x 34.5	27.0	5-40 x 32	or 1-36 x 29 x 28
44 x 36 x 60	41 x 33 x 53	41.5	8-40 x 32	or 1-36 x 29 x 40
44 x 36 x 84	41 x 33 x 77	60.2	12-40 x 32	or 1-36 x 29 x 60
Large Pallet Containers-2 wide in Van, 2 wide in Boxcar, 1-1/2" wall thickness				
54 x 44 x 28	51 x 41 x 22.5	27.2	3-48 x 40	
54 x 44 x 40	51 x 41 x 34.5	41.7	5-48 x 40	or 1-44 x 36 x 28
54 x 44 x 60	51 x 41 x 53	64.	8-48 x 40	or 1-44 x 36 x 40
54 x 44 x 84	51 x 41 x 77	93.	12-48 x 40	or 1-44 x 36 x 60
Stevedore Pallet Cont.-1 wide in Van, 2 wide in Boxcar; 2" wall thickness				
78 x 54 x 28	74 x 50 x 22	41.	4-48 x 40	
78 x 54 x 40	74 x 50 x 34	67.	6-48 x 40	or 1-54 x 44 x 28
78 x 54 x 60	74 x 50 x 52	104.	12-48 x 40	or 1-54 x 44 x 40
78 x 54 x 84	74 x 50 x 76	149.	18-48 x 40	or 1-54 x 44 x 60
Small Jumbo Pallet Containers - 1 or 2 wide in Van - 2" wall thickness				
88 x 44 x 28	84 x 40 x 22	42.7	6-48 x 40	
88 x 44 x 42	84 x 40 x 34	70.	10-48 x 40	
88 x 44 x 63	84 x 40 x 52	107.	16-48 x 40	
88 x 44 x 84	84 x 40 x 76	147.	24-48 x 40	
Large Jumbo Pallet Containers - 1 wide in Van - 2" wall thickness				
88 x 88 x 42	84 x 84 x 36	147.	20-48 x 40	
88 x 88 x 63	84 x 84 x 55	225.	32-48 x 40	
88 x 88 x 84	84 x 84 x 76	310.	48-48 x 40	

The inside dimensions of pallet containers assume that the containers 28 in and 40 in high are open top and have a base 5 to 6 in high.



Modular system of small interlocking boxes assembled into standard pallet containers

54"x 44" Pallet Containers	44"x 36" Pallet Containers
54"x 44"x 28" High Unit Incl. Base*	44"x 36"x 28" High Unit incl. Base*
54"x 44"x 14" or 28" Modular Units	44"x 36"x 14" or 28" Modular Units
44"x 27"x 14" or 28" Modular Units	36"x 22"x 14" or 28" Modular Units
27"x 22"x 14" or 28" Modular Units	22"x 18"x 14" or 28" Modular Units

* Base sections are standard size pallet containers

In addition to the four standard sizes of pallet containers, a large pallet container that can be placed either singly crosswise or two wide lengthwise in a van, is coming into use.

Cargo Containers

The term "cargo containers" designates a type of shipping container that has weatherproof construction for outdoor storage and transportation in open cars, trucks, barges, or ships. These are usually larger than pallet containers, and are used for bulk materials and for merchandise; they are of rugged construction for crane handling, and are particularly adaptable for interchange between open-truck, rail, and water transportation. Because these cargo containers are designed primarily for transportation in open gondola cars, the dimensions of the cars determine the proposed sizes.

Both large and small cargo containers can be designed for general merchandise and bulk materials, and a variety of inside fixtures for special freight or insulation and refrigeration may be used. Cargo containers can be transported on flat-frame highway vehicles and carried as hold or deck cargo on barges or ships.

They are ordinarily considered as taking the place of boxcar or covered-hopper-car bodies by the railroads, and are exempt from freight charges, both loaded and empty.

Bulk Shipping Containers

Bulk shipping containers of either the pallet or cargo type are used for handling crushed, powdered, or fluid materials. They can be used to transport bulk material in various-sized units, and they keep the material free from contamination.

Bulk-cargo containers can be made in a number of types and arranged for either lift-truck or crane handling. The drop-bottom type can be provided with or without a cover and in various heights. Such a container would be suitable for heavy coarsely crushed low-value material. Other models are provided for pulverized material.

All sizes of bulk-cargo containers should be arranged for tiering in storage and aboard ship and should be of rugged construction for handling with crane grabs or slings. They could also be provided with legs or runners with 12-in. underclearance for handling with low-lift platform trucks, or provided with fork pockets for handling with fork trucks.

Twelve small bulk-cargo containers or six large ones can be stowed in a gondola car; or four large hopper-bottomed containers can be mounted in the center of the car, between trucks, so they can be emptied without being removed. Cargo containers are particularly suited for handling by barge and for transfer by dock crane to special container cars. Here they can be discharged and returned empty without removal. Similar handling applies to flat-frame highway trailers.

Vantainers

A demountable truck body that can be used interchangeably on railroad cars, highway trucks, or trailer chassis has been under development the past few years. To meet the requirements of a universal standardized system, these van containers or "vantainers" should have certain essential characteristics:

1 Over-all cross-sectional dimensions similar to highway van bodies and not exceeding the limits legal in all states—35 ft in length, 8-ft width, and not over $12^1/_2$-ft over-all height when carried on a highway chassis.

2 An assortment of vantainer lengths to permit shipments in truck-load quantities.

CARGO CONTAINERS

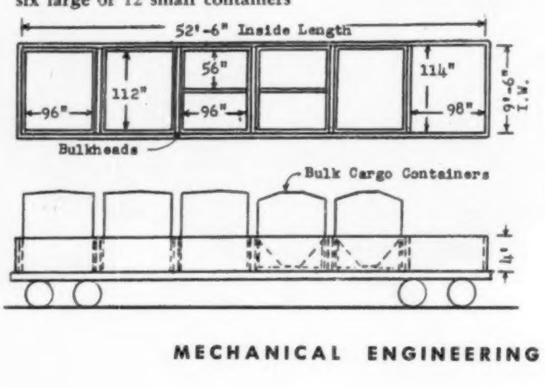
TABLE 2

PROPOSED MAXIMUM CARGO CONTAINER STANDARD SIZES

DIMENSIONS O.D. (L × W × H)	DIMENSIONS I.D. (L × W × H)	CAPACITIES Cu. Ft.	CAPACITIES Pallets
Small Cargo Containers - 2 wide in Gondola - 2-1/2" wall thickness			
96" x 56" x 84"	91" x 51" x 72"	193.	26-48" x 40"
96" x 56" x 100"	91" x 51" x 88"	236.	30-48" X 40"
Large Cargo Containers - 1 wide in Gondola - 2-1/2" wall thickness			
112" x 96" x 84"	107" x 91" x 72"	405.	52-48" x 40"
112" x 96" x 100"	107" x 91" x 88"	495.	60-48" x 40"

The inside dimensions of cargo containers assume that they are all covered and have a top thickness of 4 in. and a floor height of 8 in.

Cargo containers in 70-ton gondola container car, capacity six large or 12 small containers



3 Provision for handling by crane grabs, crane slings, fork trucks, or straddle trucks; and for tiering.

4 Rigid construction to withstand longitudinal impact on railroad cars, side racking caused by rolling of ships, and to bear the superimposed weight of other containers when tiered.

5 Aluminum construction to reduce tare weight, especially when transported by highway or air.

6 Provision inside to prevent cargo shifting from impact, side sway, or vibration.

To meet these specifications, a series of five sizes of vantainers is proposed, all with the cross-sectional dimensions of the modern highway volume van body.

The outstanding advantage in the use of vantainers is the ability of the shipper to pack a unit shipment in a suitable-sized container that can be delivered to the consignee as a sealed unit, regardless of whether the shipper or the consignee has rail or water transportation facilities. The inherent advantages of the railroads for long haul and the economic advantages of highway transportation on the short haul can both be utilized.

The railroads furnishing door-to-door pickup and delivery service maintain fleets of motor vehicles, and it is natural to haul their own trailers or flatcars between cities to avoid rehandling of the packaged freight. There are, however, many drawbacks to this service, several of which can be met by substituting a system of vantainers. Advantages in using a standardized series of vantainers in a range of sizes include the following:

1 Selection of the most suitable size of vantainers from a choice of several different capacities.

2 In addition to cross-sectional dimensions and rear doors similar to modern volume van bodies, standard vantainers have small vertical corner radii so the inside of the front end is flat and square.

3 Standard vantainers mounted on either flatcars or highway chassis are within railroad and highway-clearance regulations. The modern volume semitrailer van on a standard flatcar may exceed the American Association of Railroads equipment height limit by as much as a foot, requiring selective routing.

4 Vantainers can be positively secured to flatcars and highway chassis with a minimum of attachments, and without the use of an elaborate system of tie-down gear.

5 Loading and unloading of vantainers on and off flatcars can be done quicker, with more flexibility, and cheaper with suitable transfer equipment than is possible with trailers on flatcars.

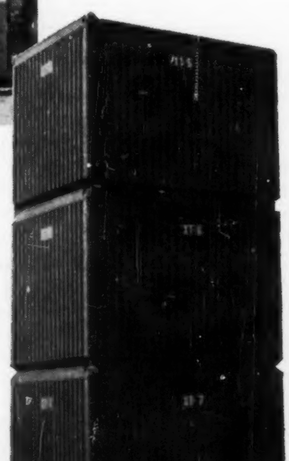
6 Loading and unloading can be done in any order; whereas the roll-on roll-off circus-type end-loading of trailers must be in order and is practically limited to a short string of flatcars.

7 Railroad container flatcars can efficiently accommodate several sizes of vantainers, providing maximum utilization of car length.

8 Highway trailer chassis used with vantainers are retained in the home fleet, rather than being shipped to distant points. Location, condition, and availability are known, and operation and maintenance are under the control of the local owner.

9 Flat container cars are smaller, lighter, and cheaper than corresponding piggy-back cars. They have

Loading the Dravo cargo containers on a truck



Tiered steel Army Conex containers

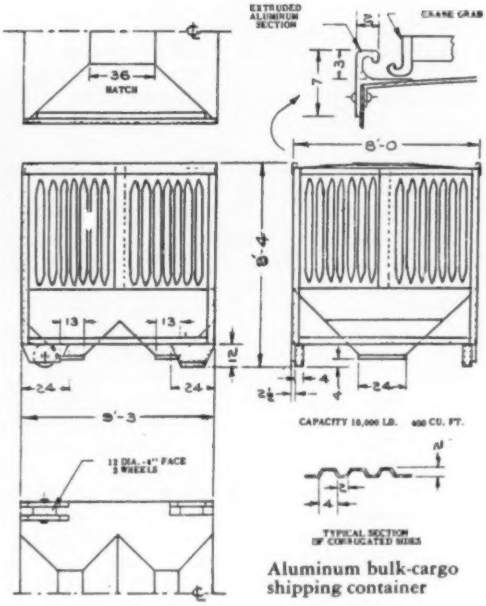
A special unit is the Aluminum deep-freeze container

BULK SHIPPING CONTAINERS

TABLE 3

PROPOSED MAXIMUM BULK SHIPPING CONTAINER STANDARD SIZES

Container	Outside Dimensions Inches	Approximate Capacity Cu Ft
Small Bulk Pallet Container	36 x 29 x 60	25
	36 x 29 x 84	35
Medium Bulk Pallet Container	44 x 36 x 60	35
	44 x 36 x 84	50
Large Bulk Pallet Container	54 x 44 x 60	50
	54 x 44 x 84	75
Stevedore Bulk Pallet Container	78 x 54 x 60	85
	78 x 54 x 84	120
Small Bulk Cargo Container	96 x 56 x 84	150
	96 x 56 x 100	190
Large Bulk Cargo Container	112 x 96 x 84	300
	112 x 96 x 100	370



Aluminum bulk-cargo shipping container

narrower open frames, and are without deck and side-guard rails or elaborate pedestal and tie-down gear.

10 Vantainers are lighter in tare weight than semi-trailers of similar capacity.

11 Vantainers represent a lower investment than semitrailers of similar capacity.

12 Vantainers occupy less space in storage and on shipboard than semitrailer units, utilizing available cubic space more efficiently.

13 Vantainers can be tiered in storage or aboard ship with still further savings in cubic space.

14 Vantainers on flatcars are not as susceptible to pilferage, sabotage, or malicious mischief as pneumatic-tired trailers lashed to flatcars.

15 Vantainers can be economically used for yard storage without tying up trailer equipment.

16 Vantainers are built of rugged construction, have internal provision for securing lading, and are securely fastened to flatcars so they can be used in regular railroad service through classification yards and switched like any boxcar; whereas, trailer-on-flatcar units must be specially routed and carefully handled to prevent damage to trailer and contents.

17 Standard vantainers in captive service can be furnished with any arrangement of doors or interior fittings to meet special requirements.

The use of vantainers is at present held back by the necessity of providing suitable equipment at the zone-transfer points for lifting the vantainers off and on railroad flatcars, highway flat-frame trucks or trailers, barges or ships. To handle the complete range of sizes of vantainers would require a 30-ton crane or at least two sizes of fork trucks.

Another drawback to the use of standardized vantainers has been the absence of a practical series of container sizes and the inadequacy of existing facilities for handling them. There are many spotty applications where several sizes and types are satisfactorily handled. The Mobilvan system and the Adapto system have successfully utilized fork trucks for transferring medium-sized containers. The Ocean Van Lines, the Missouri Pacific Railroad, and others have developed crane-handling methods for transferring the larger containers. A universal system of handling for all sizes of vantainers is needed, including cranes with electrically operated grabs or spreader slings, straddle trucks, and front and side-loading fork trucks.

The ultimate solution of the trailer-on-flatcar and vantainer problem—which will give shippers, trucking companies, and railroads the most efficient system with respect to time requirements, cost, and safety—will be a dual system that can handle both, with facilities for both lift-on lift-off and roll-on roll-off handling.

Combination Flatcars

Although a special flatcar for handling vantainers can be considerably cheaper and simpler than a piggy-back flatcar, there are advantages in a combination flatcar that can be used interchangeably for either trailers or vantainers. The proposed vantainer design permits the use of either the narrow-framed vantainer flatcar or the wide-decked flatcar generally used in trailer-on-flatcar service. Only a slight modification would be needed to adapt the currently used 75-ft piggy-back cars for handling vantainers. The transfer of vantainers between flatcar and trailer chassis by standard fork truck restricts such movement to small or medium-sized containers. A wide, hard-surfaced roadway is required alongside the track for fork trucks to maneuver the vantainers between highway chassis and flatcars. As the usual railroad flatcar is 2 or more ft wider than the van body, the fork truck must have counterweight sufficient to handle the weight of the vantainer at this extra long reach. Fork trucks can be designed to lift a 60,000-lb vantainer and place it on a standard flatcar; however, the instability of the load, the required strength of the pavement, and the maneuvering space required are so great that it is doubtful if there is economic justification for handling the large 34-ft vantainers by the usual type of end-loading fork truck.

Bulk-cargo containers in gondola container car

LCL controlled-discharge bulk-cargo container

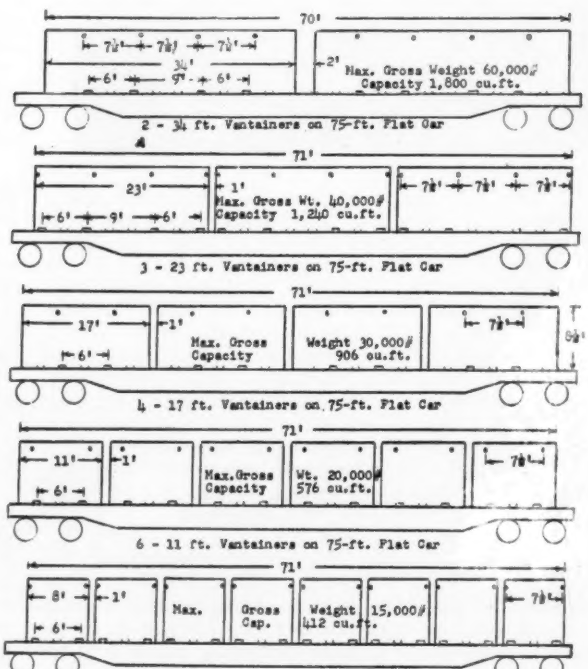
VANTAINERS

TABLE 4

PROPOSED STANDARD SIZES OF VANTAINERS

DIMENSIONS		CAPACITIES	
Outside	Inside	Cu.Ft.	No. of Containers
8 Ft. Van Containers, 8 long on 75' Flat Car - 3" Wall Thickness			
8' x 96" x 100"	7½' x 90" x 88"	412	6-36" x 29" x 84" 4-44" x 36" x 84"
11 Ft. Van Containers, 6 long on 75' Flat Car - 3" Wall Thickness			
11' x 96" x 100"	10½' x 90" x 88"	576	9-36" x 29" x 84" 6-44" x 36" x 84" 4-54" x 44" x 84"
17 Ft. Van Containers, 4 long on 75' Flat Car - 3" Wall Thickness			
17' x 96" x 100"	16½' x 90" x 88"	906-	15-36" x 29" x 84" 10-44" x 36" x 84" 6-54" x 44" x 84"
23 Ft. Van Containers, 3 long on 75' Flat Car - 3" Wall Thickness			
23' x 96" x 100"	22½' x 90" x 88"	1240	24-36" x 29" x 84" 16-44" x 36" x 84" 10-54" x 44" x 84" 5-78" x 54" x 84"
34 Ft. Van Containers, 2 long on 75' Flat Car - 3" Wall Thickness			
34' x 96" x 100"	33½' x 90" x 88"	1830	33-36" x 29" x 84" 22-44" x 36" x 84" 14-54" x 44" x 84" 7-78" x 54" x 84"

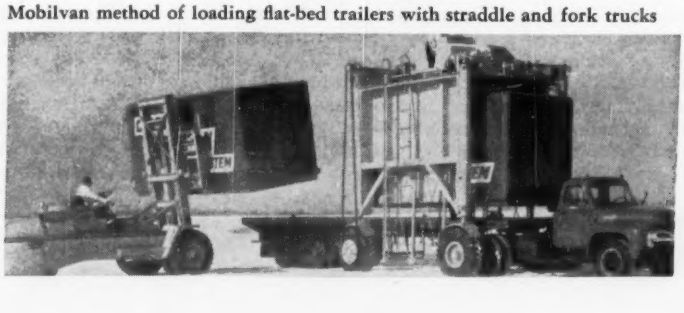
The inside dimension of vantainers is based on a 3 in wall thickness, top thickness of 4 in and a floor height of 8 in.

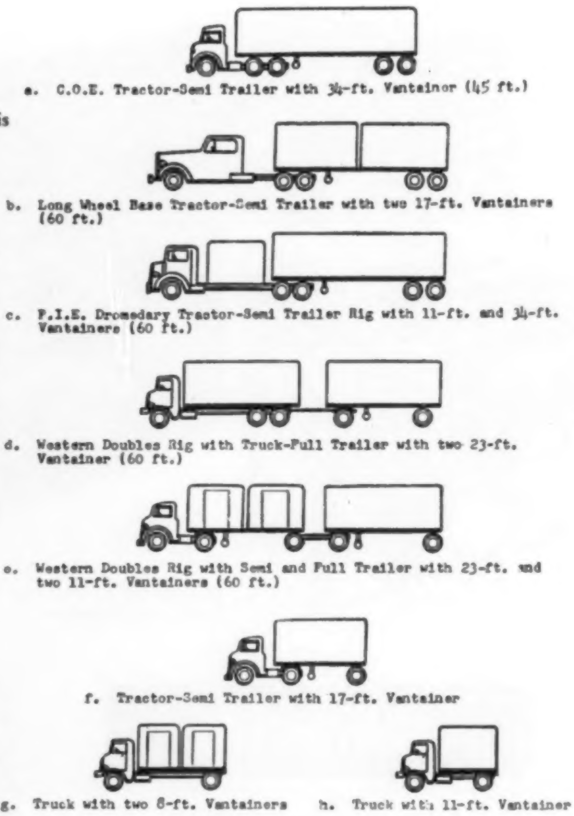


Arrangement of the vantainers on a 60-ton 75-ft flatcar

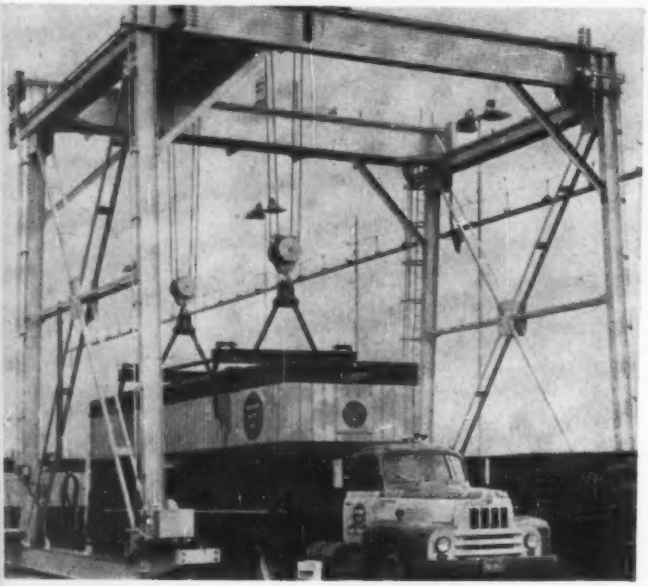
Loading van bodies with spreader slings on shipboard with revolving crane

Mobilvan method of loading flat-bed trailers with straddle and fork trucks





→ **Vantainers mounted on a highway truck and trailer chassis**



↓ **Van body being transferred from railroad car to flat-bed trailer by gantry crane**

A side-loading, retractable-carriage fork truck could, however, be built that could handle the large 34-ft vantainers in transfer yards where no crane is available. A truck of this type long enough and with sufficient capacity to handle the largest vantainers would have four forks to stabilize and distribute the load. This side-loading truck would have individually driven wheels which would uniformly distribute the load; all-around steering so it could move sideways as well as lengthways; and double-end control so that it could handle the large 23 and 34-ft vantainers without turning around, and would have outrigger jacks and shifting counterweights for stability when picking up the heaviest vantainers. This suggested side-loading truck would have many of the features of the Baker-Lull Sideloader.

Transfer Yard

The most promising solution of this problem of interchange between highway and rail carriers is, in the author's opinion, a transfer yard using cranes with the compact arrangement of dead-end tracks used in most modern transfer yards for trailer loading. Such a transfer yard could handle either trailers or vantainers by gantry crane. This yard could be so arranged that some tracks also could be served by roadways permitting fork-truck loading.

The loading of vantainers would not have to be made in any definite order, as is required for end-loading trailers, but could be loaded selectively on any car in the yard and redistributed from car to car. Straddle trucks would pick up the vantainers from the yard and leave them under the craneway extension for loading. The procedure would be the same in reverse order for unloading.

As both trailers and vantainers could be handled without interfering with each other, the changeover to vantainers would proceed without difficulty. The many advantages of the vantainer system over the trailer-on-flatcar system could be realized as soon as the railroads and large trucking companies were convinced of the time and monetary savings possible, as well as the many other advantages of the vantainer system previously discussed.

On many railroads the volume of piggy-back business has reached the point where a saving of a few dollars per trailer would justify the installation of a 30-ton yard crane. The capacity of a trailer-on-flatcar transfer yard could be increased materially by the speed and flexibility of crane loading and unloading. Since it is possible with this system to serve a longer string of flatcars with a crane than is practical with rear-end loading, additional capacity can be gained by further lengthening the craneway when justified by increased business.

Conclusion

To obtain maximum service benefits and lowest operating cost in the interchange of freight between carriers, it is necessary, in the author's opinion, for the railroads to come to a realization of the opportunities presented by a universal system of standard sizes of shipping containers. Ways should be developed and encouraged, in co-operation with the other carriers, to further the general adoption of this system of containers.

An account of the design investigation and experimental research that went into the development of boiler feed pumps for a 125,000-kw steam power plant using supercritical steam pressure of 4500 psi

Boiler Feed Pumps for Supercritical Pressure

By Hans Gartmann,[1] Mem. ASME
De Laval Steam Turbine Company, Trenton, N. J.

In 1953, the American Gas & Electric Service Corporation announced its decision to build a 125,000-kw steam plant designed for a supercritical steam pressure of 4500 psig, requiring boiler feed pumps having a discharge pressure of approximately 5500 psig. The author's firm received the contract to design and build these pumps.

Standard boiler feed pumps have been the barrel-type, having discharge pressures up to 2800 psi and driven by 3600-rpm motors, sometimes direct connected, sometimes with variable-speed couplings between driver and pump. This type of unit requires 10 to 13 stages.

The packing arrangement for these barrel pumps consists, in general, of a special combination soft packing with water cooling. Chrome steels for the interior parts eliminate erosion-corrosion with this type of pump, and for the past decade the unit has been one of the most reliable pieces of power-plant equipment.

For the new supercritical-pressure plant, the required combination of pressure, capacity, and temperature necessitated major extrapolation of previously accepted practice.

Two pumping units were to be furnished for operation in parallel. Each was to receive water from the deaerator at 217.3 psig and 384.7 F, and discharge it at the rate of 405,000 lb per hr (60 per cent of full load flow) at 5450 psig and a temperature of 525 F to the steam generator.

Among possible pump arrangements, the simplest would have been a single-casing, nine-stage unit, running at 6500 rpm and discharging water at approximately deaerator temperature to heaters. But at that time, heaters designed for such pressure were not obtainable.

Also considered was a single pump with a re-entry feature, permitting the use of heaters between the low and high-pressure stages while accomplishing the pumping in one casing. This had advantages; but the disadvantages included the high temperature differentials within the pump, which might cause expansion difficulties, plus the unusually great head that would have to be developed in each stage, leading to erosion difficulties when pumping 510 F feedwater.

A more conservative design was selected. This called for a pumping unit split into two casings (Fig. 1), the first consisting of a standard 12-stage barrel-type feed pump for a discharge pressure of 2100 psig, operating at 3550 rpm. The second pump would handle the balance of the work in eight stages, at 6500 rpm. Both the step-up gear and the hydraulic coupling for the high-pressure pump were smaller than would have been required for a single pump. This resulted in some power saving, both at full speed and reduced speed.

[1] Chief Engineer, Pump and Compressor Department.

Based on a paper contributed by the Hydraulic Division and presented at the Annual Meeting, New York, N. Y., November 25–30, 1956, of The American Society of Mechanical Engineers.

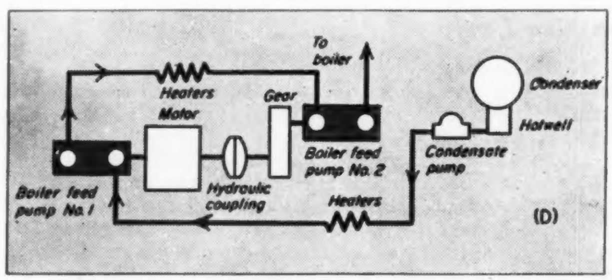


Fig. 1 Final arrangement of the boiler feed pumps, to deliver 405,000 lb per hr at 5450 psig, at 525 F. The use of two pump casings reduced temperature differentials within the casings; in a single pump, there might have been expansion difficulties. Also, heaters designed for the full discharge pressure were not then available.

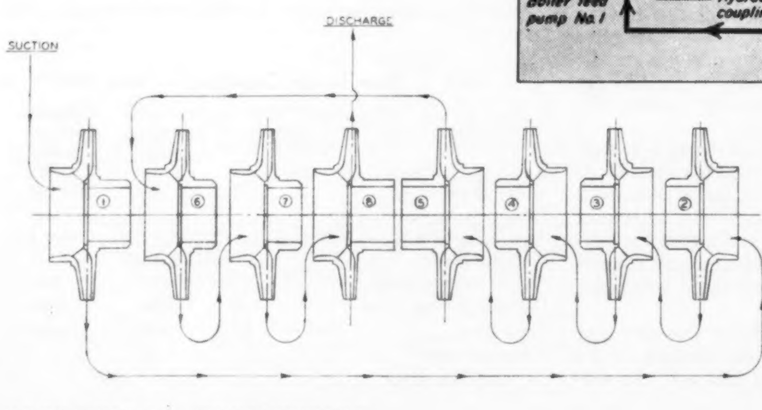


Fig. 2 The water-flow diagram for the high-pressure pump. With this opposed-impeller arrangement, the rotor is in approximate hydraulic balance, and a Kingsbury thrust bearing on the outboard end absorbs any unbalance due to small pressure variations in the different pump stages.

Designing the Pumps

The low-pressure pump was to be the De Laval Company's standard barrel-type boiler feed pump—except for the packing arrangement. The impellers all face in one direction, and the resultant thrust is eliminated by a self-adjusting balancing arrangement which automatically adjusts the intermediate pressure in the balancing chamber by a slight rotor movement.

The high-pressure pump had to develop a net pressure of 3400 psi and handle 510 F water. The suction pressure is 2065 psig, and a large part of the development work went into the design of a suitable packing for these extreme conditions.

Due to the unknown erosion effect of the high-pressure differential on the conventional balancing device, an opposed impeller arrangement was selected, as shown in Fig. 2. Here, the rotor is in approximate hydraulic balance, and a Kingsbury thrust bearing mounted on the outboard end absorbs any small imbalance caused by small pressure variations in the different pump stages.

With this impeller arrangement, the high-pressure end of the inner barrel is exposed to first-stage pressure, and a breakdown, piped to the suction, is provided so that both packing boxes are exposed to suction pressure. The breakdown between stages 5 to 8 is designed to act as a water-lubricated center bearing.

As with the standard pump, the inner casing consists of radially split diaphragms provided with twin volute passages to give minimum radial hydraulic unbalance. The entire assembly is under full discharge pressure, insuring tightness of the inner case joints. The outer barrel is made of a chromium-molybdenum alloy steel forging, designed for a test pressure of 8000 psi, with the high-pressure joint faces protected with chrome-nickel steel welded overlays. The heavy bolting for the discharge end presented a problem, and stud heating had to be resorted to, to properly prestress the studs to obtain a tight joint.

Interior parts are made of chrome steel throughout, with hard facing of Colmonoy at wearing surfaces.

Seal Development

The sealing of the high-pressure pump, with its suction of 2065 psig and 510.9 F temperature, required careful consideration. No cold sealing water is available in the cycle at this pressure.

Fig. 3 shows a diagram of the sealing system tentatively selected. A laboratory research program was instituted to insure both a satisfactory design having minimum leakage and materials that would give good service. A test rig was constructed to approximate the condition in the actual pump. The rig contained six sealing bushings arranged symmetrically about the center line to form two complete seals.

Water at 2000 psig and 500 F flowed from a central chamber outward through the clearance between shaft and inner bushings. Water at 250 psig and 80 F entered the end chambers and flowed through the clearance between the shaft and the outer two bushings. Circulation through the chambers maintained constant temperature. All rates of leakage were measured by orifice plates.

The seal bushings selected were of the floating type with a close clearance between shaft and bushing, and a large clearance between the bushing OD and the surrounding housing. One end was sealed by a lapped radial face against a matching face in the case. All bushings were pinned loosely to prevent rotation, and were spring loaded to maintain positive end contact with the fixed elements in the housing.

This type of seal has given satisfactory service in other high-pressure applications where a fluid having good lubricating qualities could be used as a sealing medium. It was realized from the start that, with water lubrication and the high temperature involved, the material combination of bushing and shaft would be the most serious problem.

The principal results of the investigation agree with the findings of Smaardyk (5)[2] and of Westphal and Glatter (6) obtained under less severe conditions of operation.

Materials for Surfaces

No combination of metallic surfaces gave satisfactory results. The only material combination that showed consistently good results was a hard-surfaced shaft—either chrome-plated, or hard-faced with Colmonoy No. 6—against a bushing made of Graphalloy, either copper-impregnated or silver-impregnated. Fig. 5 shows the results of the leakage tests with the bushings as finally selected.

The arrangement for installing the bushings in the actual pump is illustrated in Fig. 4, which shows the packing boxes for each end of the high-pressure pump.

Studying Stage Performance

As can be seen from Table I, the high-pressure pump has to develop a net pressure of 3385 psi in eight stages, or a head of 1240 ft per stage at 6531 rpm. To obtain the ultimate in pump efficiency, research was carried out to test stage performance, before the actual pump was built.

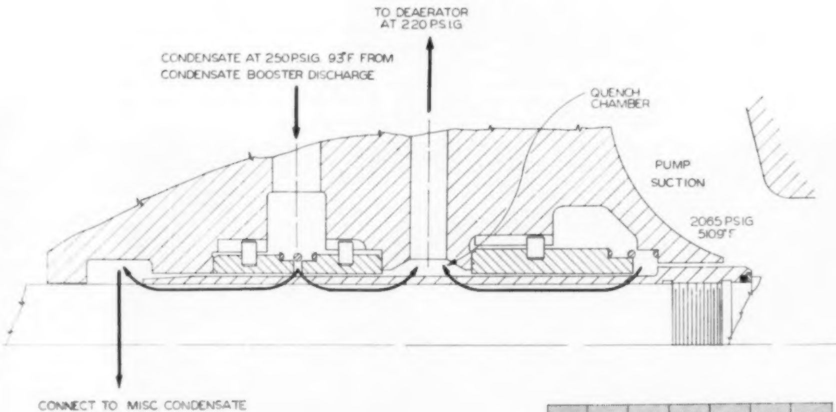
In a test rig, the outer housing was split along the axis to facilitate installation of instrumentation. A full-size pump stage, including the impeller and the appropriate diaphragms, was installed. Fig. 6 shows the test rig.

A single stage was first tested, with pressure readings taken at the suction and discharge nozzles, and the total capacity determined by adding the balance leakage to that going through the main venturi. Then an additional stage was installed, and the test repeated. By

[2] Numbers in parentheses refer to the Bibliography at the end of the paper.

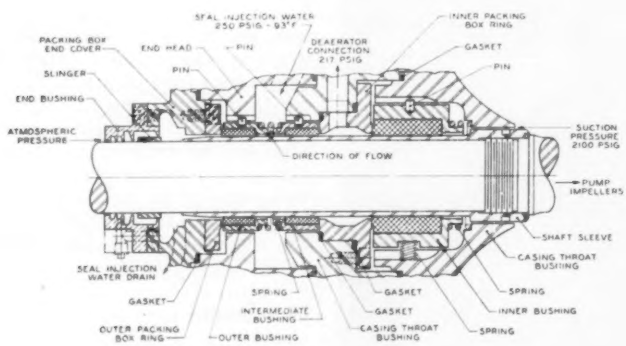
Table 1 Final Design Conditions for Each Unit

	Low-pressure pump	High-pressure pump
Pump capacity (60 per cent boiler rating), lb per hr	405,000	405,000
Pump capacity, gpm, net	931	1027
Water temp. at pump suction, deg F	384.7	510.9
Specific gravity	0.871	0.789
Suction pressure, psig	217.3	2065
Discharge pressure, psig	2100	5450
Pump speed	3550	6531
Number of stages	12	8
Rated motor hp	4000	

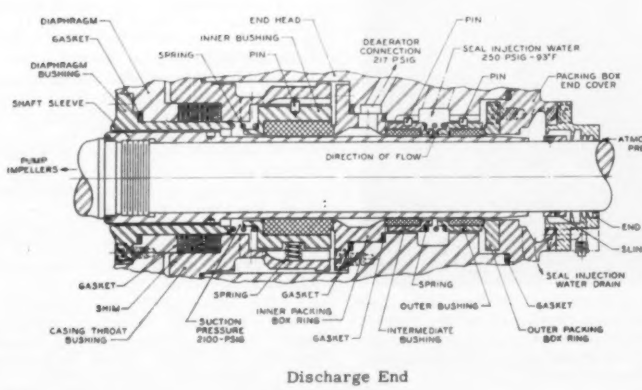


▶**Fig. 3 Sealing arrangement of the high-pressure pump. Water from the condensate booster is conducted between two sealing bushings on the outboard end. Part of the sealing water flows outward to an atmospheric drain, and part flows inward to the quench chamber. The high-pressure water flows through the inner sealing bushing and is quenched by the cold condensate coming from the center bushing; the quenched water is piped to the deaerator.**

▼Fig. 4 Section through the seals of the high-pressure pump. It was found desirable to support the high-pressure breakdown bushing by springs in their stationary condition to minimize the radial bushing movement after the unit is started up and pressure is applied to the bushing. To maintain uniformity of construction, a similar injection-type bushing seal was used for the low-pressure pump.

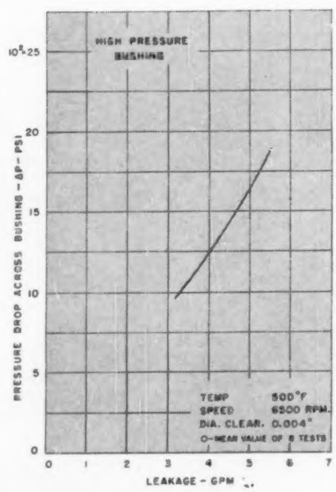


Suction End



Discharge End

▶**Fig. 5 Results of leakage tests on the bushings that were finally selected. Best materials had been found to be a hard-surfaced shaft, either chrome-plated or hard-faced with Colmonoy No. 6, with a bushing made of Graphalloy, impregnated either with copper or silver. Clearances had to be a minimum of 0.003 in. to 0.005 in. for the high-pressure breakdown, and 0.004 in. to 0.006 in. for the outer bushings.**



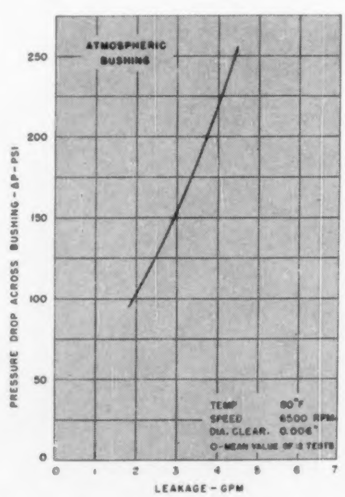
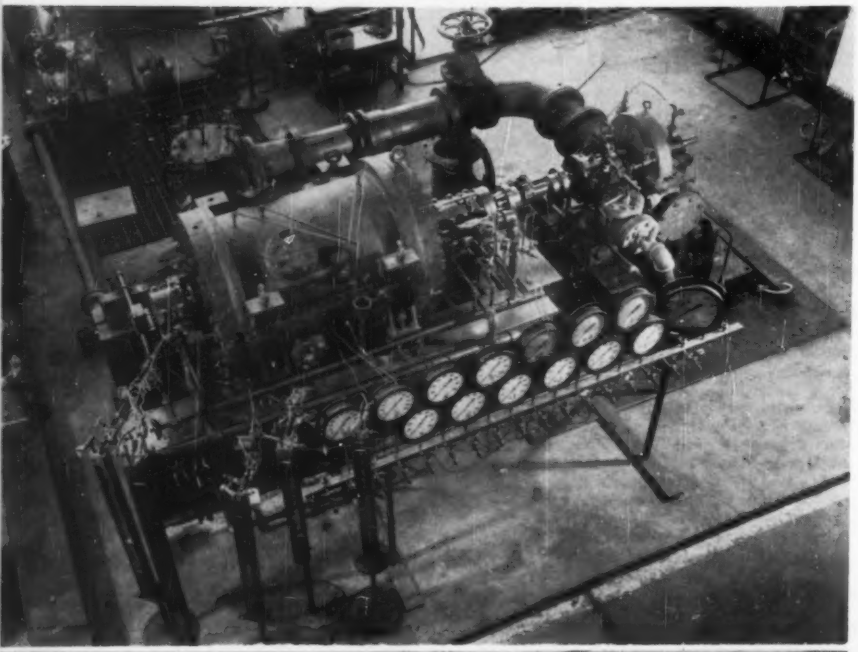


Fig. 6 Test rig for study of high-pressure stage performance. The test rotor is operated by a steam turbine, with an electric torquemeter between turbine and pump. The water, consisting of condensate from the factory power plant, is circulated in a closed loop, allowing operation at various temperatures by varying the amount of make-up from the condensate booster pump, or by circulating it through a cooler.



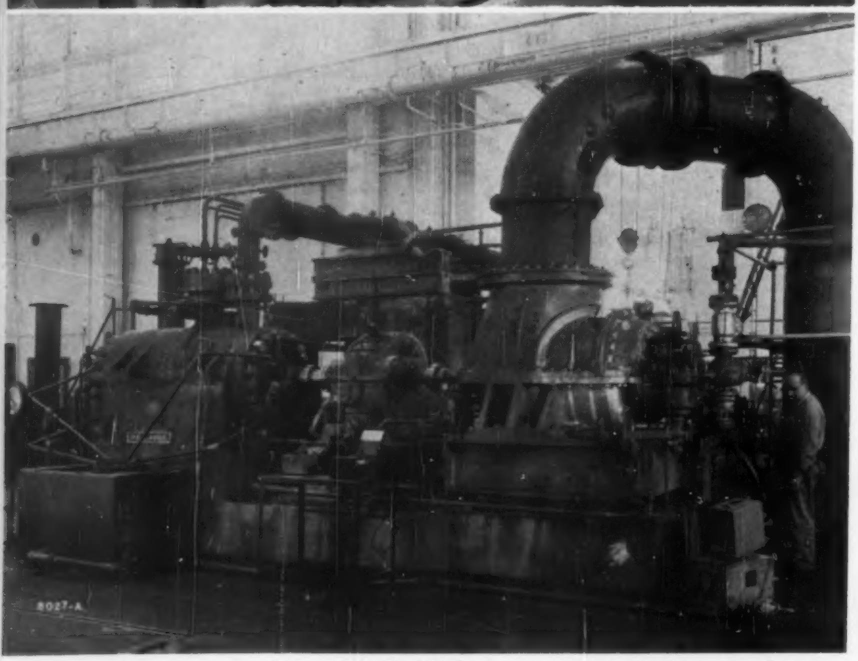


Fig. 7 The final high-pressure pump on its factory performance test. Impellers and diffusers had been developed to get perfect matching performance, and the final tests had given an ultimate stage efficiency of 77.9 per cent, with impellers of 10$^1/_8$-in. diam. This performance was considered satisfactory.

subtracting the head developed and the horsepower input of the first test from that of the second test at equivalent flow rates, the net performance of a full pump stage including the impeller, the diffuser, and the return passage, could be accurately established. In this way, unknown exit losses from the return passages of the discharge diaphragm, flow losses in the pump housing, and packing-box and bearing losses, were eliminated from the calculation. The net performance of a complete stage, including its wearing-ring leakage, was established.

Fig. 7 shows the final high-pressure pump during its factory test.

Conclusion

With the recent trend toward higher speeds in high-pressure boiler feed-pump applications, results obtained in the seal-development and high-pressure-pump studies are being successfully applied on new applications. The packingless seal is a necessity for the high rubbing speeds encountered in this service.

Advances in high-pressure heater design now make it possible to build heaters for the full discharge pressure, and the trend will probably be toward single-casing high-speed pumps for future plants in the supercritical-pressure range.

However, a pump designed for a high suction pressure and temperature and minimum injection rates will continue to have applications. It may also serve in other fields, as, for instance, pumps for nuclear-energy power plants.

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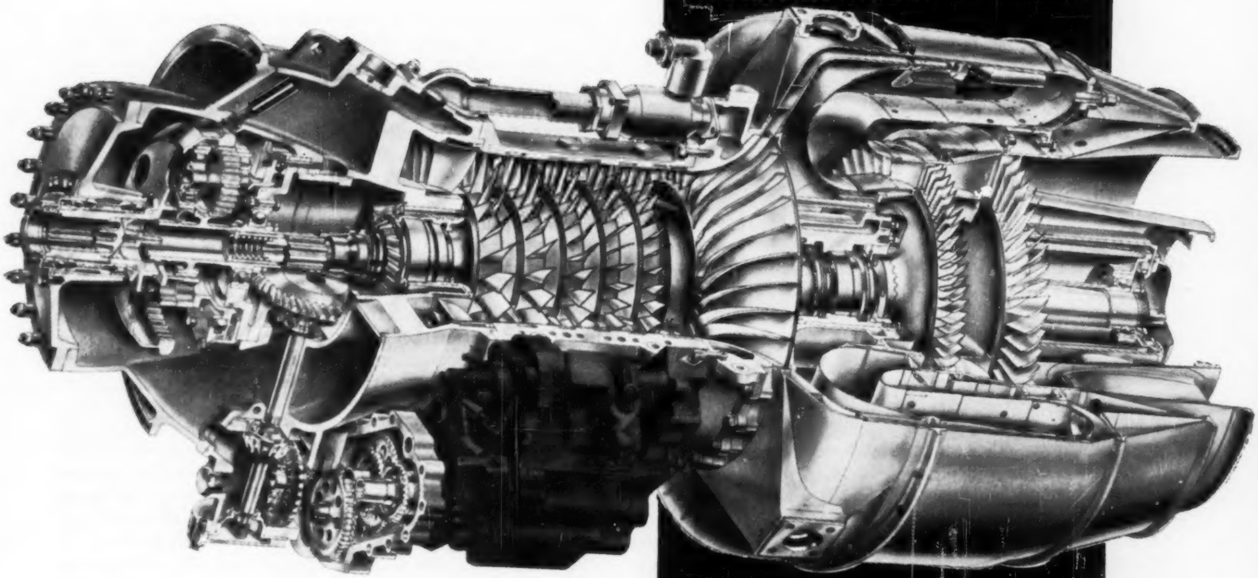
Fig. 1 The Lycoming T-53 engine, its compressor combining five axial stages and a centrifugal stage. Turbine stages are independent, so that the compressor can turn faster than the power turbine. Gas flow is reversed in the combustor.



Developing an Aircraft Gas Turbine

Lycoming's T-53—From First Trials Through the 150-hr Bench Mark Test

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Development testing on Lycoming's T-53 Aircraft engine—for the U. S. Army and U. S. Air Force—was initiated in January, 1955. The official 150-hr bench mark test, a prelude to formal qualification status, was completed in June, 1957, 31 months later. The program included the 50-hr preliminary flight rating test, completed 18 months from the start. This schedule was realized concurrent with the growth of a complete gas-turbine department from a modest beginning.

The Lycoming T-53-L-1 turboshaft engine is a helicopter power plant which has a turboprop adaptation. The basic engine configuration is shown in cutaway in Fig. 1. The air is turned and decelerated in the radial diffuser, and from that point is split, and delivered to the primary and diluent sections of the combustion chamber. The combustor is of the vaporizing type, and provides efficient flow reversal for the enveloped turbine sections. This flow reversal, coupled with the axial-centrifugal compressor, is the significant key to short engine length, and gives the added benefit of ready access to vital "hot-end" components.

The ease with which the entire combustion chamber, all turbine parts, seals, and bearings can be removed, saved tremendous amounts of development time. In most cases, it was possible for the engine to remain in the test stand while adding modified parts.

To place the development problems in the proper perspective, it must be noted that engines have run successfully in all stages of development, accumulating over 4000 hr of testing in the test cells and various field activities. In general, this testing was more rigorous than typified by model guarantees, and many major components have accumulated high running times and are in continued use. A partial list of times obtained on some components is shown in Table 1.

Contributed by the Gas Turbine Power Division and presented at the Annual Meeting, New York, N. Y., Dec. 1-6, 1957, of The American Society of Mechanical Engineers. ASME Paper No. 57—A-143.

Table 1 Hours Accumulated by Major Components During Tests

Part	Total hours
Compressor rotor assembly	over 600
Combustion chamber assembly	over 175
Gas producer and power turbine assemblies	over 250
Main reduction gear sets	250 to 400
Accessory gear-box assemblies	over 575
Accessory gear-box drive gears	over 600
Engine power control	over 250

Gas-Producer Turbine

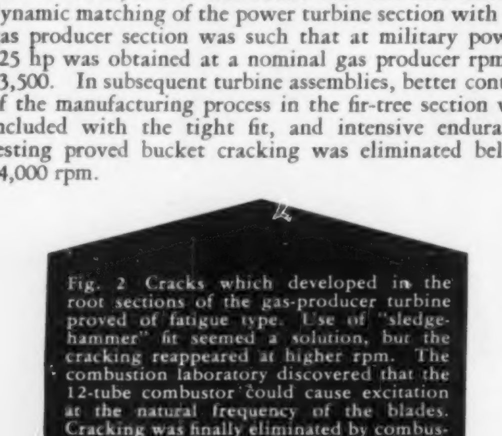
Cracks in the root sections of gas-producer turbine buckets occurred early in the development. One of the most severe cracks sustained is shown in Fig. 2. Despite this problem, the engines never lost a turbine bucket.

Lack of high-speed slip-ring strain-gage assemblies early in the program limited the manner in which the problem could be attacked. A number of new turbine wheel assemblies to the original design were obtained as quickly as possible, and each of these was run with a definitive testing program under various cycling conditions, from flight idle to maximum power. To study this cracking, the duration and operating schedules of these tests were carefully controlled and frequent inspections accomplished. Parallel to this work, a laboratory investigation was conducted to determine the nature of the material failure, and testing in the combustor-development laboratory was directed toward analysis of the combustor outlet temperature distribution.

Results showed that all cracks were of fatigue type. Also, the cracks always initiated and progressed from the root serration immediately beneath the bucket platform. With the load-carrying ability of this serration decreased, further cracking occurred in either or both of the remaining serrations. Engine tests showed that bucket cracks could be initiated in as little running time as four hours and at speeds as low as 22,000 rpm (design value 25,240 rpm). Various modifications were made, particularly in the fitting of the turbine buckets to the disk itself. These modifications included such variances as loose fits, tight fits, and fits with a nickel-plate interface. The first real success occurred with the testing of a "sledge-hammer" fit which induced mechanical deformation of the disk and eliminated mating problems associated with the necessary tolerances in the root-grinding operation.

Concurrent with this progress, full engine assemblies had been run, and it was found that the aero-thermodynamic matching of the power turbine section with the gas producer section was such that at military power, 825 hp was obtained at a nominal gas producer rpm of 23,500. In subsequent turbine assemblies, better control of the manufacturing process in the fir-tree section was included with the tight fit, and intensive endurance testing proved bucket cracking was eliminated below 24,000 rpm.

Fig. 2 Cracks which developed in the root sections of the gas-producer turbine proved of fatigue type. Use of "sledge-hammer" fit seemed a solution, but the cracking reappeared at higher rpm. The combustion laboratory discovered that the 12-tube combustor could cause excitation at the natural frequency of the blades. Cracking was finally eliminated by combustor and blade-fit redesign.



Recurrence of Root Cracking

Nonetheless, routine compressor performance evaluation test in a gas producer required residence time at many speeds above the 24,000-rpm mark previously investigated. It was after one of these tests that inspection of a turbine wheel, which had concluded a total of 118 hr of testing, revealed a partial recurrence of the root cracking problem. Further investigations were started. In particular, a critical review of the natural frequency of these turbine buckets was made.

It was found by laboratory tests that the natural frequency of the turbine bucket was lower than that previously determined analytically. The combustion laboratory verified the existence of a twelfth order harmonic in the temperature distribution. It was concluded that the combustion chamber with the 12-vaporizer-tube design could provide excitation at the natural frequency of the turbine bucket above 23,500 rpm. A redesign, reducing the number of vaporizing tubes to 11, was accomplished to shift the excitation region above that encountered during any operational condition. Concurrent with this, further fit investigations were made. An optimum practical "drive fit" was introduced, a light interference fit between the turbine-root section and the root serration in the disk itself.

In summary, the root cracking was stimulated by combustion excitation phenomena associated with the number of fuel injectors, and was compounded by improper fitting of the turbine-bucket fir-tree fastening within the disk. The problem was eliminated by combustor redesign and improved manufacturing techniques. No cracks have been experienced since the incorporation of these modifications.

Oil Consumption

The T-53 turboshaft engine, in its model specification, guarantees oil consumption of 1.0 lb per hr at military and normal power settings. The oil consumption problem was not disconcerting until full engine assemblies were run, with integral oil systems. Early engines showed a range between 30 and 45 lb per hr. It would seem that consumption in such generous quantities would be easy to pinpoint and correct. It was found that the only thing easy was a "smoky" demonstration.

The high oil consumption assumed an itinerant role and would be located sporadically in different regions within the engine. Trouble spots were the compressor forward bearing (No. 1 bearing) and the compressor rear bearing (No. 2 bearing) stations. In both regions, high-pressure differentials in the order of 20 in. Hg exist during operating conditions. In addition to this, the No. 2 bearing position, which is just forward of the gas producer turbine wheel, is in hot environment (550 F–650 F).

To permit continued testing for other developments, various "crutches" were resorted to. At the No. 1 bearing, the seal was pressurized from an external air supply to offset the high-pressure differential. In the No. 2 bearing position, it was found that the only way that oil consumption could be kept to a reasonable level was to install large auxiliary lubrication pumps which could scavenge this section, returning the oil to the oil reservoir for redelivery to the engine system. Thus oil consumption values in the order of 10 and 12 lb per hr were exhibited in October, 1955, when the first T-53 50-hr bench mark test was successfully completed.

Redesign for Accessibility

For improving the seals themselves, progress was hampered because modifications of the No. 1 and No. 2 bearing seals required complete disassemblies of the engine. To expedite the development, the No. 2 bearing position was redesigned to permit easy removal of the bearing housing, the rear seals, the No. 2 bearing itself, and the forward seal. Thus, seal configuration changes that would previously take about a week and a half to accomplish were made in less than a day.

Various seals were tested. A valuable series of tests in January, 1956, demonstrated that either a pressurized radial labyrinth or a carbon face seal would reduce oil consumption in the No. 2 bearing to a negligible quantity. With these gains and the knowledge associated with it, the No. 1 bearing system was also redesigned for internal pressurization and radial labyrinth seals.

Among secondary problem areas, the power turbine section caused the least trouble and was consistently in the order of $2^{1}/_{2}$ to 5 lb per hr from the outset. The seal between the power turbine shaft and compressor rotor shaft must be free-floating, since the two shafts experience a wide range of differential speeds. A sintered bronze seal in a steel case meets this requirement at the present time. The output drive shaft seal involved more development than originally suspected. A carbon face type seal is used at this location very successfully; however, initial attempts at sealing were distressing. The basic reason was the attempt to make the exposed end of the bell gear shaft the rubbing ring for the carbon seal. Sufficient distortion occurred on this highly polished surface when the bearing retaining nut was torqued to permit local gaps in the normal carbon contact area. In addition, this gear experiences enough "jitter" because of the cyclic tooth mating that the seal, at times, would become ineffective. The final solution incorporated an independent rubbing ring slipped over the bell gear shaft end which is maintained in place axially by the carbon seal itself.

In July, 1956, the 50-hr preliminary flight rating test showed oil consumption of $3^{1}/_{2}$ lb per hr, utilizing a completely integral oil system. An internal pressurization system has since been included in the power turbine seal section, which further reduced the over-all engine oil consumption to 0.67 lb per hr by late 1956. In general, the principal gains were attained through correctly balanced pressures in each bearing position. Other developments have been tried, particularly with carbon seals, and today the engine has demonstrated oil consumption values in the order of 0.10 lb per hr. Also, the engines remain very dry externally after tests lasting 175 hr or more.

Accessory Gear Box Drive

Another significant problem was the failure of the straight bevel gears used for driving the accessory gear box. Initial design called for spiral bevel gears, and the first five engine assemblies were built to this configuration. However, tooling and procurement of additional sets involved delays, and it was decided that straight bevel gears could serve as a stopgap measure, despite some skepticism because of high pitch line velocities (18,600 fpm). Only 198 total hours of testing were accumulated with five gears of the straight bevel type in various engines. Two failed completely, two were found cracked on removal from the engines, and

Fig. 3 Gear failure as first seen in the test cell. This straight bevel gear was used for driving the accessory gear box. Although spiral bevel gears had originally been specified, difficulties of procurement led to trials of these straight bevels. The segment missing from the horizontal gear can be seen in the lower front portion of the case.

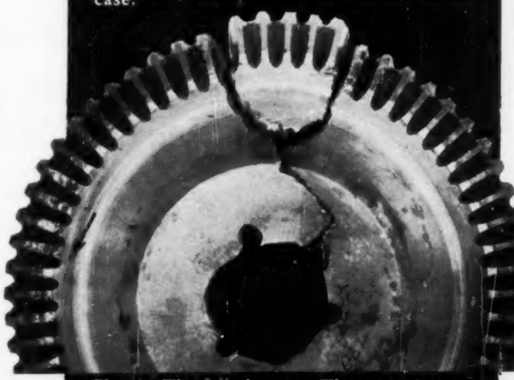
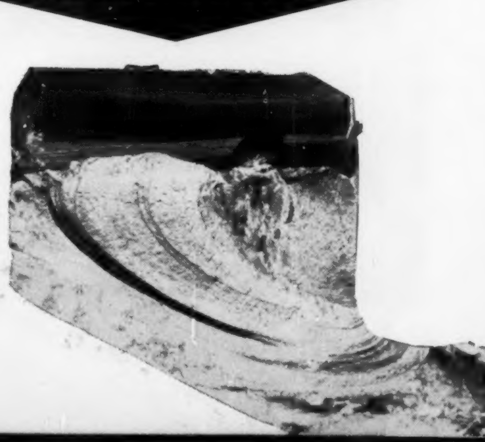


Fig. 4 The failed gear. The gear segment that was hurled about within the gear case is the only portion with completely undamaged teeth, precluding the possibility that the hub fracture was the primary failure. A crack is also perceptible at the gear rim (arrow).

Fig. 5 Close-up of the fracture, showing concentric rings, or "clamshell" pattern, indicating failure due to fatigue. Elimination of manufacturing discrepancies failed to stop the failures. It was concluded that inaccuracies in straight-bevel tooth profiles made spiral bevel gears the only solution.



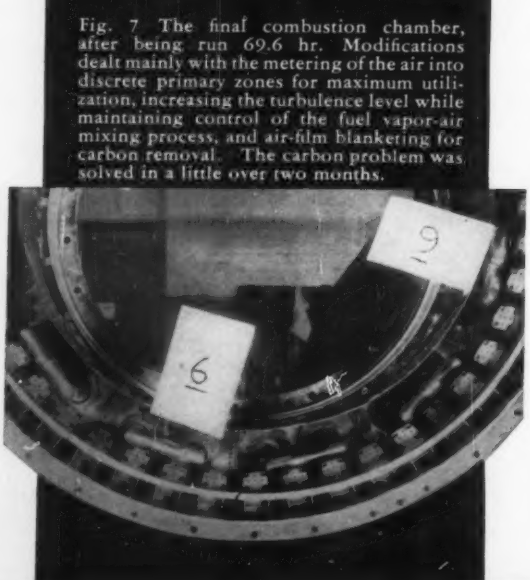
only one was found undamaged. Ironically, the latter had the highest accumulated test time of all, 75 hr, and successfully passed a 50-hr bench mark engine test.

Fig. 3 shows the condition of the gear and its surroundings as observed at the test cell on disassembly after a failure. Fig. 4 depicts the condition of the failed gear upon removal from the engine. Investigation clearly showed the failure to be of the fatigue type, as substantiated by Fig. 5, showing the typical "clam-shell" pattern, with the focal point located at the toe of the tooth. The crack pointed out earlier (and those in other gears) was opened up and a similar pattern was revealed. Investigation after the first failure indicated two manufacturing discrepancies; the presence of nitriding "white layer," and grinding "steps" in the root fillet area of the teeth. These were eliminated on gears which subsequently failed and, therefore, were not prime factors contributing significantly to the problem.

It was concluded the fatigue damage was from high dynamic loads, with local overloading at the tooth surface, brought about by inherent inaccuracies in the method of manufacture of straight bevel gear tooth profiles. Except for the 198 hours noted earlier, all engine tests have run employing spiral bevel gears, proving their superior durability characteristics for this high-speed application.

Fig. 6 Carbon deposits found in a combustion chamber at the outset of the campaign to eliminate carbon. This chamber has been in operation 1.9 hr. The relatively small nozzle throat area of a small engine makes carbon a menace that can increase the pressure ratio, and lead to compressor surge. In all, twenty combustor-chamber modifications were tested.

Fig. 7 The final combustion chamber, after being run 69.6 hr. Modifications dealt mainly with the metering of the air into discrete primary zones for maximum utilization, increasing the turbulence level while maintaining control of the fuel vapor-air mixing process, and air-film blanketing for carbon removal. The carbon problem was solved in a little over two months.



Combustor Carbon Deposition

A problem in small-size gas turbines is the formation of carbon deposits within the combustion chamber. While some carbon deposition is not uncommon in large engine combustors, the problem is rarely acute, as any coke which forms can discharge through the relatively large turbine nozzle throat areas. In general, the absolute size of carbon build-up is about the same in all engines, up to the point of mechanical breakdown of the formations. But the small engine does not permit a simple exodus of coke, since the absolute dimensions of the turbine nozzle throat area are small relative to the size of the carbon particles. Therefore, these particles are retained by the nozzle, increasing pressure ratio which can lead to compressor surge. Consequently, the combustion chamber of a small gas turbine must be developed so that it is completely free of carbon deposition.

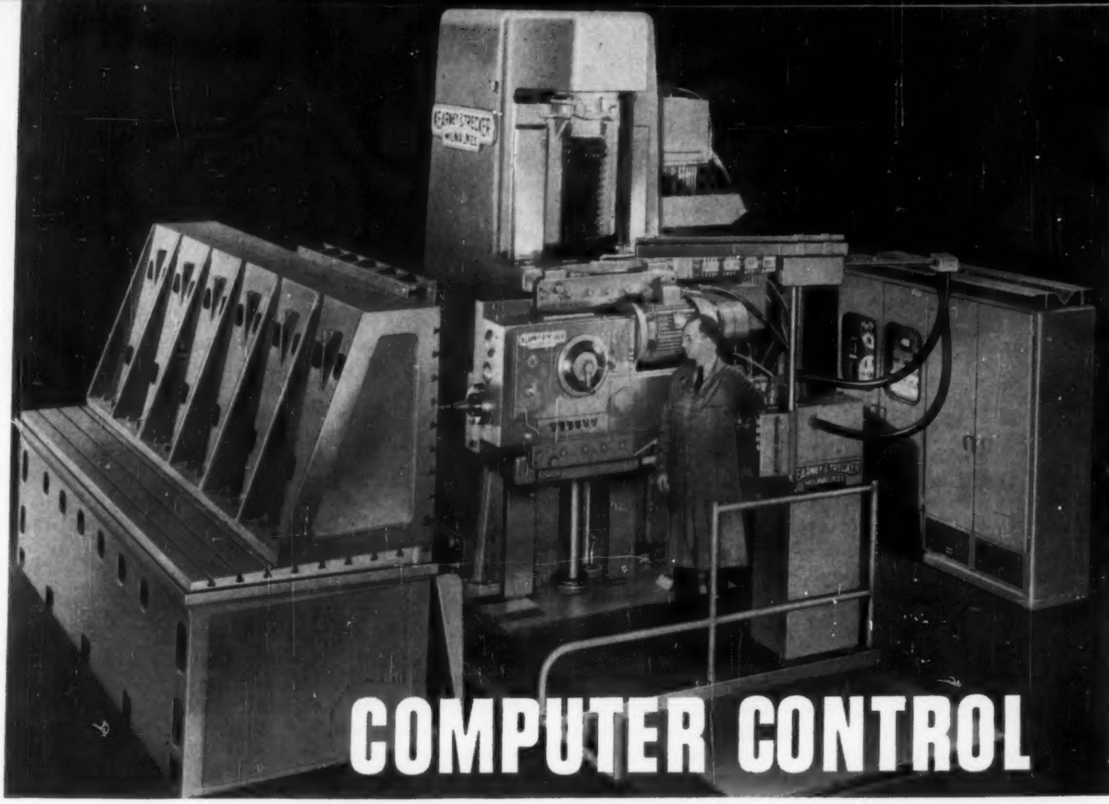
The formation of carbon in the T-53 combustor was noted generally after long-term endurance runs. At the outset, the magnitude of the problem was partly obscured by the delivery of oil laden air to the combustor. As oil consumption was reduced, and new maximum performance combustion chambers developed, the coking tendency was brought to the foreground. This occurred in the latter part of March, 1956, and it was recognized that a solution to this serious problem had to be developed quickly because of the imminence of the scheduled flight rating test. The basic aim was to rid the combustor of all deposits and to maintain the overall improvements with regard to combustion efficiency and pressure loss.

An intensive engine test program was undertaken, coupled with maximum support from the component laboratories. About 30 distinctly different vaporizer tube configurations were evaluated in full engine tests. These tests provided information on the effects of vaporizer tube heat transfer, surface condition, and area variances; the technique of fuel introduction, particularly with distribution effects within the vaporizer tube; and residence time of the fuel within the vaporizer tube. Many configurations were eliminated because of results obtained on a "cold-flow" bench-test rig built especially for fuel-airflow distribution analyses.

In addition to the development of the vaporizers, about 20 combustor-chamber modifications were incorporated during the program, with most of the changes concentrated in the combustor primary zone. As in the case of the vaporizers, nearly all liner modifications were "screened" by full-scale testing in the component laboratory. By early June, 1956 (an elapsed time of a little over two months), this rigidly co-ordinated activity produced a combustor which was free of carbon deposition and maintained near-optimum performance characteristics. The success of the "anti-coking" program is best judged by a comparison of Fig. 6 and Fig. 7, showing conditions at the outset and at the completion of the program.

Summary

This $2^1/_2$-yr undertaking accomplished the initial aims set forth for the T-53 power plant, with the helicopter version successfully completing the 50-hr preliminary flight rating and 150-hr bench mark tests at a military power rating of 825 hp. Beyond these achievements, the T-53 takes on a new turboprop look with higher power ratings, lower specific fuel consumption, and lower weight.



COMPUTER CONTROL OF MACHINE TOOLS

By George M. Reynolds, Northwestern University, Evanston, Ill.

The idea of automatic control of production machines is not a new one. Tools are already in use which take raw materials, stampings, and castings and turn them into finished products without the touch of human hands. Highly competitive mass-producing industries require procurement and maintenance of production machines at the lowest possible cost. Speed of operation and high quality are necessities; but another desirable characteristic of machine tools has become more prevalent in recent years—versatility!

Production machines which will be moderate in cost, yet high in versatility, are the topic of this paper. The study results from participation as a student in the co-operative program with a machine-tool builder, the Kearney and Trecker Corp., Milwaukee, Wis.

Computer control applied to machine tools means production machines which are self-acting and self-regulating. Instructions to these machines are recorded on tape, and the taped data interpreted into specific instructions to the production machine by a machine-control unit.

Preparation of Instructions

The first step in utilizing computer control for the manufacture of a part is the designing and drafting of the part's three orthogonal projections.

Instead of dimensioning this part by lengths and radii, it must be specified in terms of significant points relative to a system of axes. The origin for these axes is quite arbitrary, except that for some systems their origin must not be within the workpiece so that negative values will be avoided.

The points to be specified are the points of change from one curve to the next. Straight lines require detail of their end points only; circles and arcs, their radii and extent of arc. These co-ordinates are recorded on a planning sheet in the order which coincides with the cutter-tool path.

The designer can call up any ellipse, hyperbola, straight line, or parabola. A curve which does not have these characteristics can be expressed as ordinates, and if they are inserted in the planning sheet with appropriate instructions to the computer, a smooth curve can be interpolated through these points.

Also recorded on the planning sheet, alongside the appropriate point intervals, are the cutter speed and feed changes. These are necessary for the best finish possible and at the same time complete the operation in the shortest possible interval.

Awarded "Old Guard Prize" from among twelve Regional Student Conference winners, at the Semi-Annual Meeting, San Francisco, Calif., June 9–13, 1957, of The American Society of Mechanical Engineers.

The next step is to feed this information into a computer. Before this can be done, the planning sheet must be "encoded" by a device similar to a typewriter, sometimes called a flexowriter or teleprinter. While making a typewritten copy of the planning sheet, the device simultaneously punches the data, in highly condensed form, on process tape. The process tape is then inserted into the computer.

The computer carries out the detailed process calculations. It performs the necessary mathematical manipulations to describe the path of the center of the cutting tool, taking into account the radius of the cutter and cutter wear. As the computer reaches its solutions, it records them on another tape, known as the control tape. This is then inserted in the machine-control unit.

The Machine-Control Unit

Associated with each production machine is a console containing equipment for reading the control tape. As the machine-control unit interprets the control tape, it sends instructions to the production machine. These instructions are in terms of controlled power for servomotors.

For each axis of tool or table movement, one servomotor is required. For a two-dimensional profile, two servomotors are required. A three-dimensional system would need three servomotors.

For one of the special machines which Kearney and Trecker are building, Bendix hydraulic servos were selected. These motors were of the piston type, whose output can be varied from 0 to 6 bhp. Two stage valves, electronically directed by the machine-control unit, governed these servomotors.

Also under consideration for use on these machines were electrical servomotors built by Farranti Limited, of England. These servos are 3-phase, 400-cps, induction motors, delivering 0.5 bhp at 10,000 rpm. Coupled with this motor is a 1000-to-12 speed reducer, bringing the 10,000 rpm down to a usable 120.

It is necessary, in order to maintain the accuracy of the system, that all gearing and lead screws involved in the movement of cutter tool, or table, contain anti-backlash design.

Feedback Systems

Feedback is used in order that the machine-control unit can know what the production machine is doing, and how well it is carrying out the control tape's instructions. For each axis, there must be one feedback unit.

The Bendix system employs electromagnetic pulse generators. Each pulse corresponds to 0.0002 in. of tool or table movement along one of the axes.

An interesting feedback mechanism used by Farranti applies a familiar principle of physics. When a diffraction grating whose etched lines are orientated in one direction is superimposed upon another grating such that its lines are at a slight angle to those underneath, alternate light and dark bands appear. These are known as Moire fringe bands.

Moving one grating with respect to the other, these bands will move across the grating at right angles to the direction of the top grating's movement. For each grating line of displacement, one dark and light band will pass any one point on the top grating, and if there are 1000 lines per in. of grating length, each dark-band interval represents 0.001 in. relative displacement; 5000 lines per in. of grating length, and each dark-band interval represents 0.0001 in. relative displacement. Add a photoelectric cell to send the dark-band count back to the machine-control unit, and we have the exact duplication of the Farranti feedback principle.

By attaching the long grating to a moving table and maintaining the counting device stationary, the table movement will be accurately interpreted by the machine control unit.

Application of Computer Control

In testing the Farranti system, a standard vertical-milling machine was modified to accommodate the components. The machine control unit is housed in a cabinet with a tape mounted in the upper chamber.

The aircraft industry has been responsible for much of the acceleration in the application of computer control to machine tools. Missiles and aircraft must be built with maximum strength and minimum weight to withstand the dynamic forces of supersonic flight. Refinements in stress calculations, theories of elasticity and vibrations have led the aircraft industry to demand tools which will machine whole sections of planes and missiles —eliminating riveted, welded, or, in general, fabricated parts.

Machines such as these are the types under development. One is a gantry-type vertical-milling machine capable of cutting the complete integral section of a wing from ingots of aluminum, titanium, or alloys. Anyone who has seen the wing of an airplane with its fuselage removed can appreciate the complexity of this operation.

Construction had not yet been completed when this paper was prepared; however, another machine recently completed and tested is the profiler.

A horizontal milling machine of smaller proportions than the gantry type, it is designed to mill aileron linkages, wheel supports, or, in general, smaller aircraft parts of complicated and intricate shape, from forgings, castings, or solid blocks of material.

Other Applications

At present, the application of computer control on machine tools in industries other than aircraft is limited for a number of reasons. One is, that it is not yet economically feasible to equip a machine producing parts for a competitive market. The outlay in capital is large, and the return on such an investment too small to warrant it, in spite of the tremendous man-hours of labor which can be saved by its use.

In the field of computer-controlled machines, large government expenditures are now being made through the aircraft industry. The trend toward computer-controlled machines was on its way before the government's allocations, but the new funds made available have stimulated and multiplied its development many times.

Initially, controlled machines will be a boon to industries where the markets for any one item are insufficient to justify the outlay for elaborate machinery. This is typical of the heavy engineering and tooling industries. In the years to come, they will be a common sight in all plants engaged in the machining of metals.

Abstracts and Comments Based on Current Periodicals and Events

D. FREIDAY
Assistant Editor

BRIEFING THE RECORD

Sodium Reactor Experiment

THE Sodium Reactor Experiment, one of the five experimental reactors included in the original Civilian Power Reactor Program formulated by the Atomic Energy Commission in 1954, which has been generating electricity since July, was given its first public showing in November. The reactor, located in the Santa Susana Mountains, 30 miles west of Los Angeles, Calif., is the second of the original group to be completed and generate electricity. The first was the Experimental Boiling Water Reactor at the Argonne National Laboratory, Lemont, Ill.

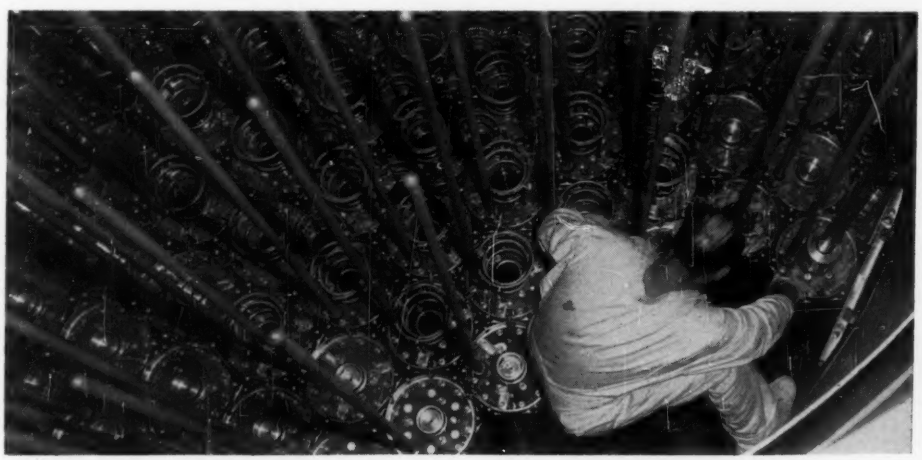
The SRE was designed and constructed by Atomics International, a division of North American Aviation, Inc., at a cost of approximately $16^3/_4$ million of which $2.85 million was borne by Atomics International and the balance by the AEC. It is of the sodium-cooled graphite-moderated thermal-heterogeneous type, designed to generate 20,000 kw of heat and 6500 kw of electricity. The fuel is uranium, slightly enriched in U-235 with thorium-uranium alloys and other fuels planned. A 75,000-electrical-kw prototype plant based on the sodium-graphite concept will be designed by Atomics International on the basis of SRE experience for the Consumers Public Power District system at Hallam, Neb.

The 10,000-ft reactor building has the reactor, primary-heat-transfer system, and the fuel-cleaning and storage cells below ground, along with hot cells for examining radioactive materials. The air-cooled U-tube-type heat exchangers for the main and auxiliary systems are adjacent to the building and connected with the intermediate heat exchanger by the secondary-sodium system.

The Southern California Edison Experimental Steam Power Plant, including the steam and turbine generators, auxiliary systems, switchgear equipment, and transmission lines is outside and adjoining the reactor building. Stainless-steel pipelines connect the steam generator to the reactor secondary-sodium systems. Sodium is routed to either the steam generator for power or to the air-cooled heat exchanger when electricity is not being generated. A 1000-thermal-kw auxiliary air-cooled heat-exchanger circuit operates continuously to supply emergency cooling in the event of a component failure in the main circuit or to remove "afterglow" following shutdown.

The 6-ft-diam 6-ft-high reactor core contains a closely packed array of hexagonal canned-graphite blocks, the moderating and reflecting material. There are 47 moderator and 72 reflector assemblies. Forty-three channels are provided for fuel and dummy elements in the centers of moderator cans. Sodium enters above the core through double-walled pipes which lead to a plenum chamber at the base of the tank into which the inlet sodium is discharged.

Each of the four control elements consists of a column of boron-nickel rings assembled on a tube which is moved in a stainless-steel thimble extending down from the top shield into a corner-channel position in the core. The four safety rods are similar to the control rods in neutron-absorbing material and thimble configurations.



The core of the SRE contains 119 moderator "cans" spaced in the cylindrical tank. Coils on top of the cans guide fuel elements into their tube openings during refueling.

The Sodium Reactor Experiment. The main building containing the reactor and other facilities is at the right; the air-cooled heat exchanger in the center. The steam generator is in left foreground, and the turbine generator behind it.

Each SRE fuel element consists of a cluster of seven rods suspended on a common hanger which is in turn attached to a plug in the loading-face shield, so the entire cluster can be removed and replaced at one time. The 6-ft long rods are made of metallic uranium slugs, sealed in a thin stainless-steel-jacket tube, with liquid-sodium-potassium alloy contained within the tube for thermal bonding. The standard fuel slugs, which are 0.75 in. in diam and 6 in. long, are made of alpha-rolled, beta-heat-treated, unalloyed, slightly enriched uranium. The seven rods forming each cluster are retained at their upper ends by a forging. At the lower end they are constrained in the axial direction, but are free to move in a vertical plane to allow for thermal expansion.

The main and auxiliary heat-transfer circuits are both divided into primary and secondary sodium loops. The radioactive primary system is contained in shielded nitrogen-filled galleries below floor level.

The return sodium from both the main and auxiliary primary loops enters the core at 500 F. At full power, the sodium exit temperature is 960 F. The secondary loops operate at temperatures approximately 60 F lower than those in the primary loops. At full power with the normal temperature gradient, the sodium flow in the main system is 485,000 lb per hr, and the auxiliary system flow is 24,250 lb per hr.

The sodium pumps, one in each of the four heat-transfer loops, are modified hot-process pumps similar to the type used in refineries. Principal modifications consist of vertical mounting and the addition of sodium seals at the shaft and at the case. Each of the primary pumps has its case and drive shaft extended sufficiently to pass up through the gallery shielding to the floor level, where it may be serviced by withdrawing all internal parts through the case into the reactor room.

The pumps are fabricated from type 304 stainless steel except for the shaft and impeller, which are type 316. Primary-system pumps have a 3-in. shaft and $13^{1}/_{2}$-in. impeller. The main primary pump is driven by a 25-hp motor, the main secondary by a 50-hp motor. Auxiliary motors are 2 hp each.

The control problems in sodium-cooled graphite-moderated reactors were the subject of an article by J. E. Owens on pp. 749–753 of the August, 1957, issue of Mechanical Engineering. Other recent items on the SRE appeared in the Briefing the Record section, p. 873, September, 1957, and p. 669, July, 1957.

Enlisting Heat Transfer

With space at a premium on surface craft, and measured in fractions of an inch on submarines, the Navy is attempting to bring food processing to the level of efficiency found in the chemical industry.

Not only savings in space, but a \$50-million to \$70-million annual saving on the Navy's $\$^{1}/_{2}$-million-a-day food bill are the purpose of Commissary Research at the U. S. Naval Supply Research and Development Facility in the Naval Supply Depot at Bayonne, N. J.

Mass feeding is in its infancy so far as technical development is concerned. Automation, work simplification, and equipment design, controlled by human engineering and functional requirements are all being experimented with for 75, 250, and 700-man ships, and watched with interest by manufacturers and trade associations.

The return has been \$15 for each dollar spent on research, and an even better ratio is being sought. Standard equipment is evaluated wherever available and usable, but the 440-volt requirement for shipboard service, the special operating conditions at sea, and the exceptional demands of submarine service require the development of special equipment in many instances.

The application of heat-transfer research to these problems is relatively new, and the Facility has a calibration laboratory equipped to check standards on any temperature-measuring device and on most electrical equipment in its 77 F 50-per-cent-relative-humidity atmosphere. The Bureau of Standards has the only superior facility for this work.

Setting a pot on the surface plate of an electric grill is not the ideal method of heat transfer, and various devices for "bringing the heat to the pot, or the pot to the heat" are being employed. Ovens which burnt on the top shelf and refused to bake on the bottom shelf are being replaced with heat-circulating models which take the heat uniformly to every portion. The "cool" areas of grills represent waste space, and means of equalizing these temperatures are also sought.

The two workhorses of every large Navy galley, the steam kettle and the steam table, are also being studied. Good food will no longer have all the flavor steamed out of it if the warming properties of infrared lamps prove as satisfactory as expected.

Heat losses will be cut 50 per cent by the use of insulation on the steam kettles, and a man tossed against a kettle by a heavy sea will be unharmed in spite of operation at 40 psi 287 F. An automatic simmer control will not only save steam but reduce weight losses in meat by 10 per cent and save minerals and vitamins at the 185 F temp. The "traditional" boat oar for stirring will be replaced with a new lightweight stainproof aluminum paddle. An incidental outcome of some of this research was the first fail-safe thermostat.

The scullery isn't overlooked either. Using a "synthetic soil" of lard, peanut butter, lampblack, and other hard-to-remove ingredients, the spray patterns of a number of tray cleaners have been investigated. Most promise is shown by a 100-psi 160-F method which has been adapted from a bark-peeler that is used in the lumber industry.

Dounreay

A REVIEW of progress at the Dounreay site in general, and of the fast reactor design and construction in particular, is summarized by the AEC from two British nuclear-engineering journals. The Dounreay site in Scotland is to be a major development center. Its most important installation will be the 60-thermal-mw sodium-cooled fast-breeder reactor. However, it will also contain a 10-mw materials-testing reactor, DMTR. Fuel-fabrication and chemical-processing plants will handle the fuel for the two reactors.

The fast-breeder reactor will be fueled initially with a U235-U238 mixture of relatively high enrichment, and ultimately, it is planned, with plutonium. Coolant is liquid sodium, but early operation will be with NaK to avoid freezing problems. Noteworthy features are:

1 Fuel elements are annular in cross section. The reasons for this design are not discussed, but it is known that the British have given a great deal of attention to the problem of fuel-element bowing.

2 Niobium (columbium) jackets are used for the core fuel elements. The previous practice of jacketing metallic-uranium fuel elements with steel allows the possibility of formation of a eutectic alloy of uranium and iron if the uranium ever approaches the melting point.

3 A multiplicity of coolant loops is used. There are 24 primary heat exchangers, each with its own electromagnetic pump and cold trap, and 12 secondary heat exchangers, each with its own economizer, evaporator, and superheating sections, and served by two electromagnetic pumps. The use of many coolant loops minimizes the probability of loss of cooling by pump failure. Six independent groups of diesel alternators, each consisting of three 120-kw units, supply power to the pumps via independent cable systems. The capacity of a single pump is 400 gpm at a pressure drop of 16 psi. By comparison, the capacity of the electromagnetic pump used on EBR-1 was 500 gpm.

4 Each primary heat exchanger is made of a single continuous coil of large-diameter coaxial stainless-steel tube. The inner tube has an ID of 4 in. and carries the primary coolant, and the outer tube has an ID of 6 in.

5 The secondary heat exchangers are made up of units which "consist of a central water pipe surrounded symmetrically by, but not in direct contact with, four liquid-metal pipes. Heat transfer from sodium to water is by conduction through thousands of copper laminations of about 10-gage thickness threaded over the five pipes and separated from each other only by brazing foil. The tubes are expanded into the holes in the laminations and the whole assembly heated to fuse the brazing foil, thus forming a completely bonded unit."

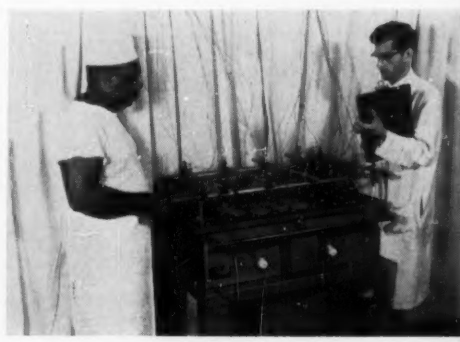
6 Steam is generated at the relatively low pressure of 150 psi and is superheated to 518 F. It is stated that these steam conditions may be improved later to 200 psi and 622 F. EBR-1 generated steam at 405 psi and 529 F. The primary coolant inlet temperature is approximately 392 F and the outlet approximately 662 F. Corresponding values for EBR-1 were 442 F and 600 F.

7 The containment shell, a sphere of 135 ft diam, is of steel having thicknesses from 1 in. to 1 $^{7}/_{8}$ in., and is designed to withstand internal pressure of +18 psig and g. −3 psi

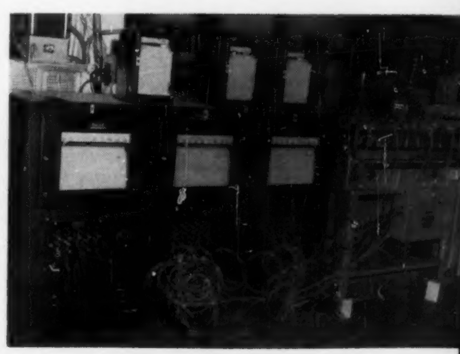
A complete overhaul of the submarine galley resulted in better separation of working area from the crew's space, since the main gangway of the sub passes through the area and the dining tables are used by the crew for recreation space in off hours. Sandwiches and other refreshments for men on watch are kept in better condition; there is a 30.4 per cent saving in footage walked by the cook; a 29.2 per cent saving in time; and a reduction of 1 crew man required. Since food-carrying capacity has become more critical than fuel-carrying capacity on nuclear submarines, freezing, packaging, and dehydrating techniques will have to come to the aid of the submarine larder. With morale a problem in the tense requirements for accuracy and compatibility, the food has to be good.

So far as the equipment is concerned, every piece that goes into a submarine galley has been studied for its versatility in menu preparation, its efficiency, and the space it requires. One outcome, in addition to improved refrigerators, stoves, and ovens, is Unimike. Within a 28-in. square it provides a heavy-duty food mixer, potato peeler, steam kettle, pressure cooker, refrigerated kettle, proof box (for testing bread dough), meat grinder, vegetable slicer, and a small oven that will do pot roasts and some other types of oven baking and roasting. It will wash, peel, cook, and mash enough potatoes for 80 men without removing them from the pot.

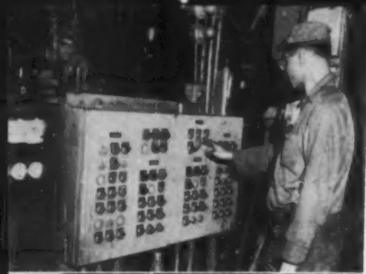
As soon as the agenda permits, Unimike will be given exhaustive tests and then will probably become standard equipment for submarines and other small craft.



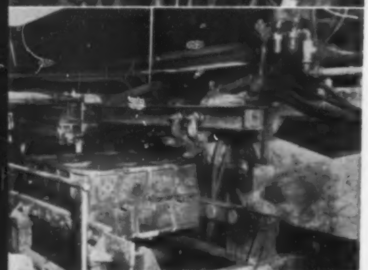
Uneven heat distribution has been corrected through temperature studies, adding 25 per cent to cooking capacity



I-C thermocouples record 60 points in sequence every 38 sec in this test of a griddle which operates in halves

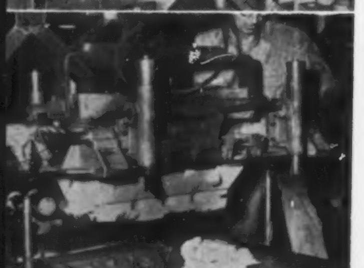


A master panel controls the functions of this complete automated-foundry line

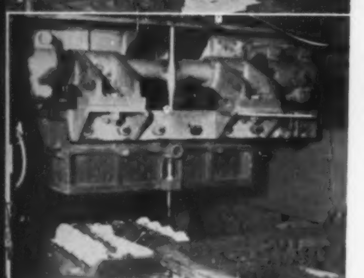


The drag flask having been filled, jolted, squeezed, and drawn is being automatically moved to the roll-over station

The preassembled cores are transferred by a core-setting fixture which lifts the core assembly as a unit

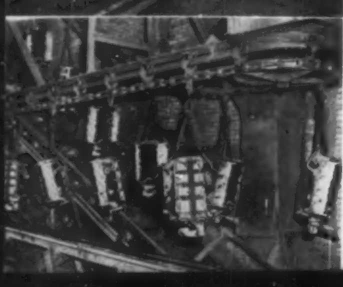


The core-setting fixture is brought manually into position over the drag mold. Guide pins insure a perfect setting of the core assembly.



The closing machine lowers cope over cored drag for automatic-closing-operation

The molds are conveyed through the pouring area and weighted automatically prior to pouring



The hot V-8 blocks are carried by overhead conveyer to the cooling tower

Automatic Foundry

The Pontiac Motor Division, Pontiac, Mich., has been using an automatic cylinder-block-production system for two years. Many problems were involved in automating the foundry. Limit switches and electronic equipment object to the oil and chip environment of machine-shop operation, and operations literally throw sand into the works. Transfer problems involve moving transfer flasks filled with molding sand and cylinder blocks weighing a ton or more.

Pontiac Motor Division's foundry engineers at Pontiac, Mich., in co-operation with the Osborn Manufacturing Company, of Cleveland, Ohio, have been using an automated-cylinder-block system for two years.

Pontiac's foundry is now producing an average of 150 engine blocks an hour. This line produces 2400 V-8 engine-block castings per day. Only 20 men are today doing the work that took 68 on former block-molding operations. The automatic production unit is capable of cycling over 200 molds per hr.

Absenteeism, heat, fatigue, and skill have a minimum effect on the Osborn molding system with the limited number of personnel needed to operate the automatic unit. The unit assumes the duties of molding, closing, and shaking out without the need of any manual handling of flasks. Only for setting chaplets and cores, and pouring, drag spraying, and hanging blocks on a cooling conveyer is there need for workers other than watchmen to maintain a constant check of the control of the panel-indicator lights and for maintenance men to check and correct reasons for minor stoppages.

The unit performs the complete molding cycle from the time sand enters the molding machine until the closed mold enters the pouring and cooling zone. After cooling, the unit completes the cycle by stripping the cope from the drag, shaking out the sand and engine-block castings, and returning the empty flasks to the molding unit.

The various operations in the unit are interlocked by electrical and pneumatic controls, and the controls are designed so that they may be preset for required cycle time and production. The handling equipment is built in multiples of flask lengths. The movement of the flasks through the system occurs progressively through a distance representing approximately a flask length. Pusher cylinders are used in conjunction with conveyers to move the heavy flasks. A master control panel, manned at all times, is capable of controlling all phases of the automatic system.

The flow of molds and the equipment involved in the foundry system are as follows:

There are two Osborn 4-station molding machines, one for making copes, and a similar one for making drags. They are identical in principle but require somewhat different setups and auxiliary equipment because the cope is deeper than the drag, and the drag has to be rolled over to bring it face up.

Each Osborn machine has four stations and includes an indexing mechanism that carries the patterns and molds from station to station.

The operation begins at the drag-molding machine. The metal pattern is blown off by an air jet and then sprayed with a parting lubricant at the make-ready station. While this proceeds, the conveyer moves the drag flask into the filling station. When indexing is complete, the pattern is automatically elevated. In moving upward inside the drag flask, the pattern picks up the flask and makes it ready for filling. Slight further upward motion results in opening the sand-hopper gates and releasing the sand from the hopper which fills the flask with a predetermined amount of sand. The pattern with the flask still in place is lowered to the indexing mechanism which moves the pattern and flask to the third station where the jolt-squeeze action occurs.

Jolting and squeezing take place with the mold and floating pattern plates free of the indexing mechanism. After this operation is completed, the flask is indexed to the draw station. In the meantime, another flask is being filled and another pattern prepared at the respective stations, as previously described.

At the stripping station, the mold and pattern are raised. The mold is then drawn on rollers when the draw piston descends, returning the pattern to the rest position on the indexing cradle arms. The drag mold is then ejected onto a conveyer where it is moved to a turnover station. When fully inside the rollover, the drag is automatically turned through 180 deg, bringing the drag face up, ready to be moved off onto a conveyer for the next operation, which is spraying the drag mold with a quick-drying graphite solution.

After spraying, the drag molds are pushed onto the coring conveyer. The seven cores which are to be set are preassembled and set into a fixture on a conveyer which carries them to the setting station. They are manually removed from the conveyer by means of a core-setting fixture which lifts the cores as a unit and positions them in the drag in a matter of a few seconds. Thus the entire core assembly is set quickly and accurately.

Meanwhile, the cope is being processed on a similar Osborn molding machine. The copes are made precisely the same way as the drags. At the fourth station, withdrawal of the pattern leaves the cope in an elevated position. The cope is moved out automatically into the closing machine, and is positioned directly above the drag. The closing unit lowers the cope onto the drag and accurately closes the mold. The closed mold is then moved out of this position onto a conveyer which carries it to the pouring conveyer. Pouring is done on the conveyer in the pouring area. After pouring, the molds continue on the conveyers for the required cooling time, and then arrive at the jolt shakeout area. Castings are removed, flasks emptied, and the cope and drag halves conveyed back to Osborn molding machines.

The handling equipment, though not a part of the molding machines, is integrated with them and synchronized in such a way that flasks approach and enter the machines at the proper intervals and the mold halves are handled out of the machines when ready for such transfer. Indexing and transfers are effected pneumatically and hydraulically in response to solenoid valves, actuated for the most part by the master timer.

Even the sand supply for this V-8 block line is handled automatically. Sand from the shakeout is checked by probes and the correct amount of water and bonding material is added automatically in the muller. After mulling, the sand is delivered on conveyers to the molding-machine hoppers.

A complete preventative-maintenance program for this automatic-foundry unit has been one of the principal reasons for its success. A four-man maintenance crew is available during each of the two shifts the unit operates. This crew consists of a pipefitter, electrician, millwright, and repairman. During the third shift when the unit is closed down, a crew cleans, checks, and repairs all key operations and machinery units.

Additional economies are also realized by Pontiac in their core-making department. Here eleven Osborn Automatic Roto-Core units turn out the various core requirements. One such machine, for example, is capable of turning out 360 barrel and crankcase cores each hour. These five-station machines blow and draw the core boxes automatically on a preset time cycle. The cores are baked, assembled, and loaded into conveyers for delivery to the molding line. Pontiac has also done an outstanding job of core simplification, reducing the number of cores used in their cylinder-block castings to seven.

Radar Signal Enhancement

Analysis of the fine structure of the radar signal has resulted in new techniques that will increase the power of radar "many hundreds of times."

High sensitivity and precise velocity are the principal gains from the 3-yr research project carried out in the Electronics Research Laboratories at Columbia University under an Air Force research contract.

Although the details of the technique are a military secret, and production is some distance away, announcement was made at this stage because of the implications for the enhancement of any electromagnetic signal.

The significance for the improvement of radar circuitry and hardware was termed "probably the greatest single advance in radar since the start of World War II and the early British work," by John R. Dunning, Mem. ASME, and dean of the Columbia school of engineering.

Since the strength of the radar echo decreases as the fourth power of the distance to the target, existing radar techniques would achieve increased range only through substantial increases in the power of the radar.

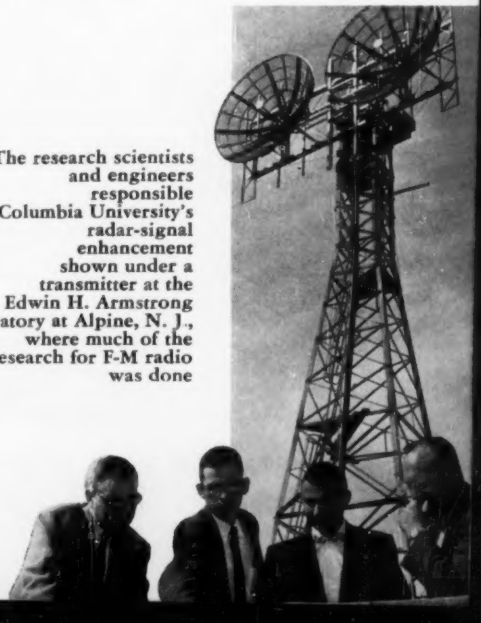
If it is necessary to double the range at which aircraft can be spotted, such methods would require a 16-times increase in power. A 10-times increase in range would require a 10,000-fold increase in power. Direct increases in power also increase the random output or "noise," making it difficult to distinguish the signal.

The basic problem was to devise a means of generating a signal that would reinforce itself and become prominent against the "noise" background. Lawrence H. O'Neill, director of the Laboratories, quoted the late Edwin H. Armstrong, who did much of the pioneering work in frequency modulation, as stating: "You can see a signal, however weak, if you can make it sit still long enough."

In the Columbia-Air Force system, the signal is enhanced by being made to "sit still for a major fraction of a second."

The system employs a special modulator for the carrier at the transmitting end and utilizes a receiving system which embodies a technique of coherent integration for signal enhancement.

Other participants in the research were R. I. Bernstein, associate director of the Laboratories; Sterling Fisher, supervisor of the radar division; and John H. Bose, associate in electrical engineering, and a former assistant to Major Armstrong.



The research scientists and engineers responsible for Columbia University's radar-signal enhancement shown under a transmitter at the Edwin H. Armstrong Laboratory at Alpine, N. J., where much of the research for F-M radio was done

▲11:15 am. Research engineer makes photographic analysis of a punch-press operation. The high-speed camera records shock, shear, and tear characteristics.

▼11:18 am. Daylight loading film spool is dropped into feeding compartment. After feeding first two inches, operation is automatic.

▶11:20 am. First few feet of film emerge dry and ready for inspection. Adjustment to compensate for exposure or chemical temperature variances can be made

▼11:34 am. 100-ft roll of 16-mm film is completely developed and ready for projection. Film travels at the rate of six feet per minute. Speeds up to ten feet per minute are possible.

Rapid Film Processor

Twenty minutes from camera to projector is the processing time for a 100-ft roll of 16-mm film in Fairchild Instrument Company's new automatic, self-feeding, portable, rapid-film-processing device.

"Mini-Rapid 16" was developed by Fairchild's Industrial Camera Division. The first of a family of film-and-paper-processing equipment, the device is expected to be of greatest value in engineering photographic work.

Major elements in the processor, about the size of a standard file drawer, are the four easily interchangeable, film transport, 18-oz plastic tanks containing a high-speed developer, a rapid fixer, a hypo-eliminating agent, and a rinse. Drying is carried out by impingement of a high-velocity air jet on the emulsion side of the film. Film lengths as short as one foot or as long as 400 ft may be processed without the necessity of changing or replenishing the chemical solutions.

Manual operation of the unit begins with the placement of exposed 16-mm film in the film compartment. After insertion of the film into the entry port, with emulsion side down, the film-supply compartment is closed and the film automatically threads itself through the processor to the take-up compartment, a distance of approximately 6 ft 8 in.

Rubber rollers on the plastic-insert assembly serve a triple function—drive rollers for film transport, as a means of agitation, and squeegeeing the exhausted solution back into the solution container, thus reducing solution carryover from one tank to another. The rollers are on floating shafts, and the shafts are retained against the driven center drum by an elastic member.

Take-up, the second manual operation, is accomplished by attaching the leading edge of the processed film to a standard daylight-loading spool and dropping the spool into the take-up compartment where it rides on a rubber-covered film spool which is slightly overdriven. The film is taken up firmly and ready for projection.

A variable-speed film-drive system makes it possible to adjust the rate of processing for over and underexposed film and/or temperature variations. The film may be checked for degree of development at the take-up spool, and the speed adjusted to compensate for any errors in exposure. Thus the control may be used to preselect a specified degree of development when all the other factors are known.

Color Tape Recorders

Delivery of RCA's first production models of tape recorders for prerecording and originating both color and monochrome telecasts will begin in December, 1958. The color recorder will carry a list price of $63,000; the black and white version $49,500.

Commercial availability of video tape-recording equipment will mean an increase in color programming and an improvement in the quality of color and monochrome recorded programs.

Six of seven custom-built prototype units were purchased by the National Broadcasting Company for delivery to its new Tape Central which will be completed next spring at the NBC studios in Burbank, Calif. The seventh custom-built, preproduction recorder was purchased by Jefferson Standard Broadcasting Company for delivery in September to its Charlotte, N. C., TV station, WBTV. This installation will mark the first use of an RCA color-video tape recorder for prerecording and originating local color and monochrome telecasts.

Synthetic Latex Expansion

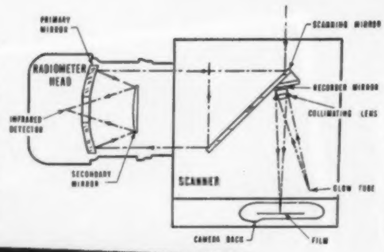
Completion of $2^3/_4$-million worth of new production facilities will boost the rated capacity of the Goodyear Tire and Rubber Company's synthetic latex plant at Akron, Ohio, to 27,500 tons annually.

Originally opened in 1942, the Akron installation, built and operated by Goodyear for the government, was the first of the nation's synthetic rubber plants to go into full production. With this 50 per cent increase in capacity, it becomes the world's largest synthetic plant devoted exclusively to the production of high-solids latex.

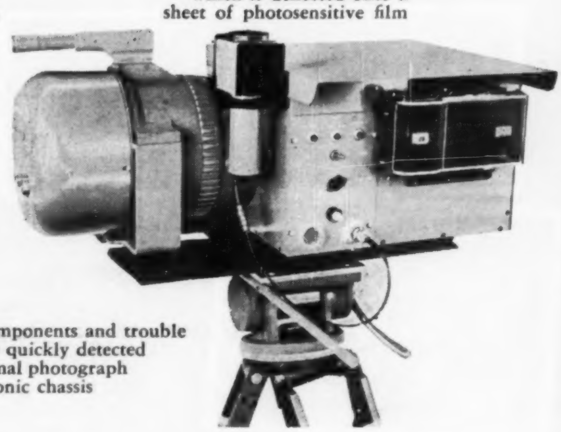
Coupled with Goodyear's Houston, Texas, plant where a $10-million expansion was completed in May, and which currently is producing dry-type synthetic rubber at the rate of 220,000 tons annually, Goodyear's combined synthetic-rubber capacity will be 247,500 tons.

One of the main features of the Akron plant expansion is the addition of 10 reactors, each with a capacity of 3750 gal. In addition, a new recovery area consisting of two butadiene and two styrene recovery columns was added.

The scanning system of ▶ the camera uses a small mirror attached to the back of a larger oscillating mirror to deflect the glow of the modulated light beam in line-by-line scanning similar to television scanning



The Barnes Far-Infrared ▼ Camera uses the electrical output of a radiometer to modulate the intensity of a light beam which is deflected onto a sheet of photosensitive film



◀ Faulty components and trouble spots can be quickly detected from a thermal photograph of an electronic chassis

Thermal Photography

ORDINARY infrared photography has been in use for about a quarter of a century. By interposing a method of amplification between the detection and recording of infrared radiation, Barnes Engineering Company of Stamford, Conn., has multiplied the range and utility.

The Barnes Far-Infrared Camera uses an OptiTherm Radiometer system for measuring the infrared radiation, a scanning attachment, and a visual camera to record the image. An oscillating mirror scans the scene line by line and directs the radiation to a thermistor bolometer whose electrical output modulates the intensity of a glow tube. A smaller mirror attached to the back of the same oscillating mirror deflects the glow tube output onto the sensitive surface of Polaroid Land film. Since the small mirror is attached to the back of the scanning mirror, its motion exactly duplicates that of the scanning mirror. Scanning time varies from about 1 to 14 min.

The finished photograph is a composite of as many as 30,000 picture elements, and a gray scale consisting of a series of tones corresponding to an accurately known equivalent black-body temperature provides a means for quickly determining temperature at any point.

The OptiTherm Radiometer is uniformly sensitive from 0.7 to 40 microns. Since 75 per cent or more of the radiation below 1000 C lies beyond 2.3 microns, it is readily apparent how much the range was been extended beyond that of conventional infrared photography which is limited to about 1.35 microns. Hence the term "far-infrared" camera.

The camera can detect temperature differences as small as 0.02 C, and gives an absolute quantitative record of the emitted heat, permitting detailed analysis of surface-temperature distributions not possible with other infrared scanning or imaging devices.

Perhaps the widest application for thermal photography falls within the field of scanning industrial equipment and processes. A heat picture of a refinery, for example, will show readily where hot spots—potential sources of trouble—may be developing.

Similarly, heat patterns can detect faulty welds, overheating of machine parts, defects in metal castings and built-up sections. All objects emit heat unless they are at absolute zero, hence the range is extremely broad. Any portion of the infrared band can be selected for photography, since the gray scale gives an absolute basis for comparison.

Direct Heat to Electricity

DIRECT conversion of heat energy into electrical energy has been achieved in an electronic device developed at the General Electric Research Laboratory.

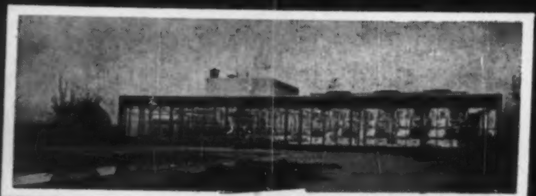
The new thermionic converter, not yet a commercial product, was invented by Volney C. Wilson, and takes advantage of the simple fact that electrons can be "boiled out" of a hot metal surface and used to produce an electric current directly. Experimental converters already have changed more than eight per cent of the applied heat energy into electric power.

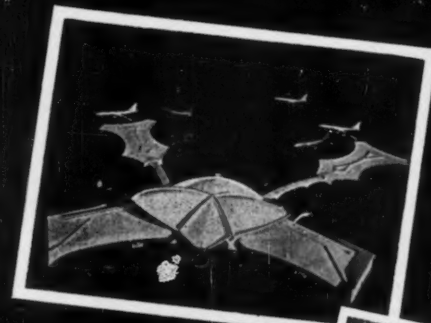
Thermionic converters combine several known scientific principles in a unique manner. Two electrodes within the tubelike device are maintained at high, but different, temperatures. New approaches to the design of the electrodes, the materials used, and the gas environment within the envelope have resulted in a more efficient flow of electrons than ever noted before.

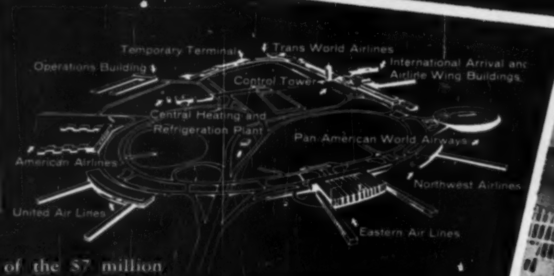
In a simplified explanation of his invention, Dr. Wilson says that when heat boils electrons out of the metal surface, it is analogous to lifting water to the top of a hill and providing a smooth, uninterrupted path down the hill to permit it to do such work as turning a wheel. The thermionic converter essentially smooths the path of electrons from a hot electrode to a cooler one.

Most previous methods of converting heat directly into electricity—without rotating machinery—have been based on the thermocouple, a device long used by scientists for measurement and control functions. Thermocouples utilizing a junction of two different kinds of metal produce small electric currents when heated, but their efficiencies normally are well below one per cent.

One obvious difference between the thermionic converter and the thermocouple is that in the converter the metals are separated by a gas at very low pressure. There is an electrical flow between the electrodes, but there is less flow of heat than through a metal. Thus the electrodes can be at different temperatures, and the efficiency is greatly increased. It is hoped that thermionic converters ultimately may be able to change more than 30 per cent of heat energy directly into electricity.







Reading clockwise: Interior of the $7 million Central Heating and Refrigerating plant, built to serve the entire Terminal City; the outside of the same glass-enclosed plant, in which pipes have been decorated in colors—green pipes for chilled water, blue ones for cooling-tower water, red for hot water; TWA's projected terminal, with its finger-like passageways which will house moving sidewalks to the two outer structures; the entrance to the airport's huge control tower, seen through the entrance arch; Liberty Plaza, looking toward the control tower and the arch of the International Arrival Building and Airline Wing Buildings. *Center:* Map of the Terminal City. TWA is one of six major airlines that will design and construct their own terminal buildings on the rim of the "City."

Aerial Gateway

Engineers who attended the ASME's Annual Meeting found themselves in New York when the International Airport dedicated its first great public building at the Terminal City. The International Arrival Building opened on Dec. 5, 1957. Visitors discovered the immensity of the operation which will function, in the future, as the eastern gateway to the United States.

The airport (Idlewild) is 16 miles from the heart of Manhattan. It is about the same distance from the Narrows through which voyagers have sailed, for three centuries, as they entered the new world.

Not until 1960 will the city-within-an-airfield be completed, and by that time the planes at the starting gates will be the huge jet airliners for which the terminal has been designed. But the International Arrival Building is functioning now, ready to receive foreign passengers at a rate of 1000 per hour. (At present, the rate at the hours of maximum load is 500 per hour.) When you re-enter the United States, you will clear through Customs and Health-and-Immigration swiftly, conveniently, and in comfort.

On Nov. 13, 1957, Trans World Airlines unveiled plans for its new $12-million terminal building which will occupy a site adjacent to the International Arrival Building. Moving sidewalks will be among the features of this fabulous way station designed by Eero Saarinen and Associates.

Architect Saarinen, called on to create a bold new structure to combine efficient reception with the glamor of the air age, came up with an imaginative design, notable for its soaring central structure, reminiscent of a giant bird in flight. The traveler can proceed logically and pleasantly through the procedures of take-off and arrival, all in an atmosphere of dignity and elegance. The design has been calculated so that the noise of plane operations will not be obtrusive. Windows will be rubber-mounted.

From the central structure, the traveler will proceed to one of the two ramp houses which will provide lounge rooms for each flight. It is in the passage from the central building to these ramp structures that you will encounter moving sidewalks on which you will travel at 120 ft per min, a moderate pace.

(At the Annual Meeting of the ASME, Dec. 1–6, 1957, P. W. Freitag, Jr., project engineer with the Goodyear Tire and Rubber Company, presented a paper on passenger belt-conveyer transportation.)

A seating area has been designed with upholstered seats arranged in tiers so that visitors can sit, as in a theater, watching the spectacle of planes landing and taking off. TWA has planned the terminal for the handling of its jet airliners, the 120-passenger Boeing 707's. According to present plans, however, the new terminal will be finished in time to serve the present TWA fleet. Construction is to begin in April, 1958, with the first phase completed in mid-1959.

Combined Gas-Steam-Turbine Plant

A GAS-TURBINE generator and conventional steam-turbine generator will operate in a combined cycle in a 15-mw plant being constructed at Warwick, Ga.

The plant was described in a talk at an ASME Central Savannah River Area Section Meeting by W. D. Sinclair, manager of the Crisp County Power Commission of Cordele, Ga., which will operate the plant. Details are from a report prepared by W. J. Whatley, Mem. ASME, mechanical engineer, Patchen & Zimmerman, Augusta, Ga.

The combination resulted from research for a reliable, economic, and efficient cycle which will satisfy a daily peak condition, together with the base-load requirement, during low-water periods when the hydroelectric system owned by the Commission is inoperative. The new plant will be located adjacent to the hydro station on Lake Blackshear, where ample cooling water will be available and combined operation under one supervisor will be possible.

Steam-Boiler Arrangement

A unique steam-boiler arrangement has been developed by the Babcock & Wilcox Company to operate in the combined gas-steam-turbine cycle, utilizing some of the Btu's in 355,000 lb of gas per hr, which exhausts from the gas turbine at 840 F to increase cycle efficiency. The boiler was designed to produce 130,000 lb of steam per hr at 625 psig and 825 F, either when firing pulverized coal, natural gas, or oil alone, or in combination with the exhaust from the gas turbine.

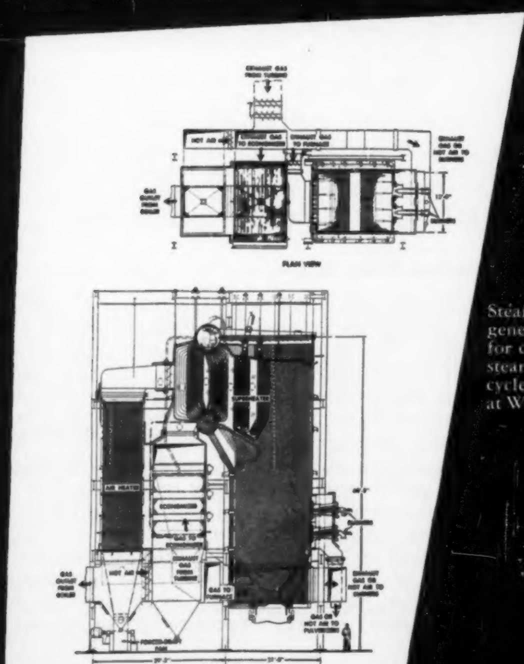
The exhaust from the gas turbine containing about 16 per cent O_2 is suitable for further use as preheated combustion air. Since the exhaust gas contains more oxygen than is required for combustion of the auxiliary fuel in the boiler, some of it must be by-passed around the burner windbox. A portion is tempered with room air to make it possible for drying and transporting the coal in the pulverizer, and becomes primary burner air.

Some of it also enters the furnace through the hopper bottom, serving to maintain steam temperatures at loads down to 90,000 lb of steam per hr. That part of the gas-turbine exhaust which by-passes the boiler mixes with the boiler exit flue gas and enters the economizer, where further heat is recovered before it passes to the stack.

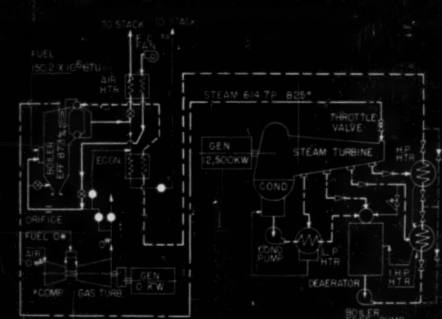
The boiler is designed for pressure operation on the gas side, eliminating the need for an induced-draft fan so that, during combination conditions, only the fans for the pulverizers are required, thus reducing auxiliary-power consumption. When the gas turbine is not running, a tubular air heater is used to provide hot air for combustion and drying of wet coal in the pulverizer. Under these conditions, a forced-draft fan is required. The two pulverizers are sized so that only one is required when the gas turbine is in operation; however, both are required for full-load requirements when the gas turbine is not running.

Steam and Gas Turbines

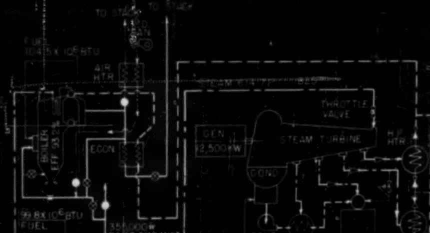
The General Electric Company's steam turbine is basically of the high-efficiency, impulse design. Maximum rating is 12,500 kw, 3600 rpm, straight condensing, designed for steam conditions of 600 psig, 825 F, and 2 in. Hg abs back pressure. Full-load steam rate at the throttle is 8.93 lb per kwhr during combined gas-steam-turbine operation. The steam-driven generator is rated at 12,500 kva, 0.8 pf, 13,800 volt, 3-phase, 60 cycle. It has four corner-mounted vertical air coolers and a direct-connected exciter.



Steam generator for combined gas-steam-turbine cycle plant at Warwick, Ga.



Maximum rated heat balance for the straight steam cycle



Maximum rated heat balance for the combined gas-steam-turbine cycle

The gas turbine is a standard General Electric 5000-kw, simple-cycle, single-shaft unit, designed for operation on natural-gas fuel, rated 6900 rpm at 80 F compressor-inlet temperature and 14.17 psia compressor-inlet and turbine-discharge pressure. The generator is rated 6250 kva; 0.8 pf, 2-pole, 3-phase, 60 cycle, 2400/4160 volts; 3600 rpm. The generator is driven through a high-speed high-precision double-helical single-reduction gear at 6900/3600 rpm.

Feedwater Heating

The feedwater-heating cycle is designed to operate with four stages of regenerative feedwater heating. The calculated expected flows, pressures, and temperatures at different points in the system, as well as the anticipated heat rate for the combined gas-turbine steam-turbine cycle are indicated on the diagram. The condensed steam from the hot well of the main surface condenser is pumped through the inter and after condensers of the steam-jet air-removal ejectors, then through the low-pressure, horizontal, closed feedwater heater, and then to the deaerator-type open heater.

The boiler feed pumps will obtain suction from the deaerating-heater reserve-water storage and pump directly to the boiler economizer, by-passing the two high-pressure closed feedwater heaters. Feedwater flowing through the economizer absorbs additional heat to increase the boiler efficiency by approximately 6 per cent. Drainage from the low-pressure heater will be automatically returned to the surface condenser after being cooled in the drain-cooler section of the low-pressure heater.

The straight steam-turbine cycle is shown in the other figure. Condensed steam from the condenser hot well is pumped through the inter and after condensers of the steam-jet air-removal ejectors, then through the low-pressure feedwater heater and on to the deaerator. Boiler feed pumps will obtain suction from the deaerating heater and discharge the feedwater successively through the i-h-p and h-p vertical feedwater heaters. From the heaters the feedwater will go directly to the boiler. Drains from the h-p heater will automatically cascade back to the i-h-p heater, and the combined drains from that heater will flow back to the deaerator. Drains from the l-p heater will return to the condenser, as in the other operating cycle. Make-up from either operating cycle will be supplied from a demineralizing water-treatment plant. Station drips and drainage will also supply a percentage of the make-up water. The entire system will be under automatic control.

The plant will be an entirely outdoor design. All of the components are conventional pieces of equipment proved in operation; only the arrangement and heat cycle are unproved in operation.

Nuclear Briefs

▶ Shippingport Start-Up

The world's first full-scale central-station atomic power plant devoted exclusively to civilian purposes went critical at Shippingport, Pa., on Dec. 2, 1957, the 15th anniversary of the achievement of self-sustaining nuclear fission in the world's first reactor at Chicago, Ill., designed and built under the supervision of the late Enrico Fermi.

The Westinghouse Electric Corporation designed and constructed the nuclear portions of the 60-electrical-mw plant under contract with the Atomic Energy Commission. The Duquesne Light Company contributed $5 million toward the nuclear portion of the pressurized-water plant; constructed, at its expense, the turbine-generator portion; and will operate the entire plant for the AEC.

▶ Liquid-Metal-Fuel Reactor Experiment

A reference design has been developed for the AEC by the Babcock & Wilcox Company for the Liquid-Metal-Fuel Reactor Experiment, LMFRE. The liquid-metal-fuel reactor concept is interpreted to mean a liquid-metal, circulating-fuel, thermal breeder reactor. The fuel is a solution of uranium dissolved in bismuth; the moderator is unclad graphite; and the breeding fluid is a slurry of thorium-bismuthide dispersed in bismuth.

The concept is sufficiently flexible that it might be a burner, converter, or breeder reactor, although the latter has been chosen as the type that can be tested in the shortest period of time and has sufficient economic attractiveness to justify the effort.

An ultimate plant of 200-mw electrical capacity is the objective. Details are from a status report by R. T. Schomer, Mem. ASME. Additional information will be presented at the 1958 Nuclear Congress, March 16–22, Chicago, Ill.

▶ Atomic Computer

An electronic computer built and designed by Argonne National Laboratory, Lemont, Ill., has been named "George." Argonne mathematicians will let George do it when they have problems to solve.

George is a high-speed digital machine capable of making 200,000 separate additions of numbers a second, yet compact enough to be fitted into the average-sized living room. It will operate at 115 volts on nuclear-produced electric power from the Experimental Boiling Water Reactor and is the first of three new computers to be installed at Argonne.

The design, development, and final construction took three years of co-ordinated effort on the part of Argonne's mathematicians and engineers. The cost was approximately $303,000, about one sixth the cost of comparable commercially produced machines. This figure, however, does not include developmental work and time spent by regular salaried laboratory personnel.

▶ Flexible Plastic Reactor

The Flexible Plastic Reactor is a versatile, inexpensive critical assembly for studying water-moderated reactor concepts. The objective in the design was provision of a highly flexible and accessible critical assembly, adaptable to rapid large-scale composition and geometry changes while retaining reproducibility and reliability of reactor measurements.

Polyethylene plus void to simulate water was used since a costly container could be avoided by this use of solid moderator, while permitting access to both ends, and a central plane in the assembly.

Although no conclusive full-scale experimental substitution of polyethylene for water has been performed in a reactor, several auxiliary experiments at Knolls Atomic Power Laboratory operated by the General Elec-

tric Company for the AEC have indicated that the nuclear differences which exist between polyethylene and water have a negligible effect on the accuracy of critical-assembly measurements.

The FPR cost was modest for a critical assembly, $230-000 including design, development, procurement, fabrication, installation, and debugging of the reactor system. Core materials such as polyethylene, aluminum, borated polyethylene, and cadmium cost another $30,000. Operational cost has been comparable to that for other critical assemblies. The ease of making changes in core composition and geometry has contributed significantly to a high rate of procurement of timely experimental information. The assembly has been used for both reactor concept surveys and for study of basic reactor problems since it was brought to critical early in 1956. Details were given in a paper presented at the Winter meeting of the American Nuclear Society by S. W. Kitchen and others of the Knolls Atomic Power Laboratory staff.

Materials Briefs

▶ Delayed Failure in Steel

Hydrogen has recently been identified as the cause of failure of ultra-high-strength steel parts at static stresses well below the conventional yield strength of the material.

The study, undertaken by Case Institute of Technology for Wright Air Development Center, was an extension of previous investigations of the effects of three specific variables—hydrogen distribution, test temperature, and prestressing—on hydrogen-induced brittle fracture of 43-40 steel in static fatigue.

An electrical-resistance method was used to measure crack-propagation characteristics in hydrogen-charged and aged specimens and in specimens prestressed prior to charging.

It was observed that crack propagation in aged specimens was sensitive to hydrogen distribution but relatively independent of the applied stress for a given hydrogen distribution.

Internal cracks were noted in aged specimens even in the presence of a sharp external notch. The temperature dependence of the rupture time indicated that crack propagation was diffusion-controlled both in aged specimens and in specimens with an initial surface concentration of hydrogen. Prestressing prior to electrolytic charging with hydrogen tended to diminish delayed failure.

The 44-page report, "Effects of Physical Variables on Delayed Failure in Steel," by R. D. Johnson, H. H. Johnson, J. G. Morlet, and A. R. Troiano is available for $1.25 on order number PB 121456 from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

▶ Fiberglas Jet Vane

Successful fabrication and test of a jet vane manufactured of laminated Fiberglas, reinforced with phenolic resin, have been made by American Aerophysics Corporation of El Segundo, Calif. The Jet Propulsion Laboratory of the California Institute of Technology, who is the designer of the jet-vane configuration, has found that tests in the rocket blast of a missile have proved extremely successful.

American Aerophysics employed a unique arrangement of laminations which produced superior resistance to the severe eroding environments within the rocket blast. Instead of laying the laminates in parallel, they were placed with their edges sloped in the direction of the jet stream in order to avoid separation or tearing of the individual laminates. An extremely high-strength phenolic resin was used as a binder.

▶ Niobium and Niobium Alloys

Niobium (columbium) metal of unusual purity, and niobium alloys processing high strength at high temperatures, have been developed by du Pont to help solve critical design problems in jet engines, guided missiles, and atomic reactors.

The company's Pigments Department, Wilmington, Del., which has been a leader in the technical and commercial development of titanium, a lightweight metal used in aircraft, and hyperpure silicon, a semiconductor used in electronic devices, has been producing experimental quantities of pure niobium metal and niobium alloys.

Thompson Products, of Cleveland, Ohio, a leading producer of jet-engine parts and other aircraft components, will develop forging and other fabrication techniques for the du Pont system of alloys.

Use of niobium alloys in such critical parts as turbine buckets may lead to more efficient gas turbines capable of running at temperature in the range of 2000 to 2200 F.

Since the over-all performance of these engines is geared to the temperatures at which they can be run, operation at higher temperature would result in greater thrust per unit of engine weight and increased thermodynamic efficiency per unit weight of fuel.

In addition to its potential use in turbine buckets, niobium could also be used in jet-engine burner tunnels, in skins for supersonic missiles, and in ramjet tail pipes.

The metal also has a low neutron cross section which would make it an excellent candidate for atomic-energy applications.

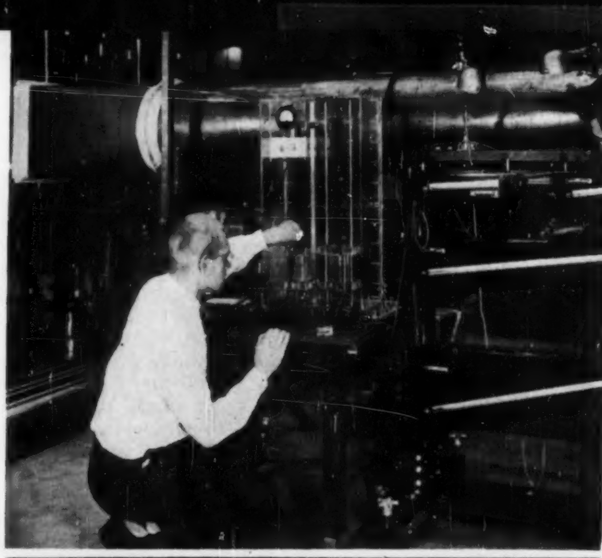
▶ Fusible Silicone Rubber

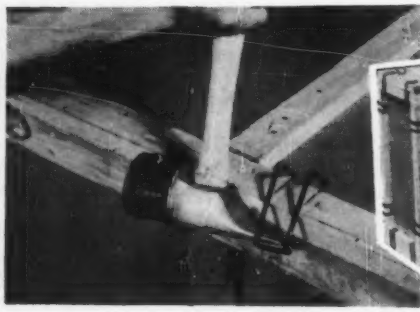
Fusible-silicone-rubber compounds with built-in adhesive properties which retain the good physical and electrical properties inherent in the premium-grade silicone compounds are available on a limited scale in two forms: K-1605R, a general-purpose insulating type, and Y-1622, a conductive compound.

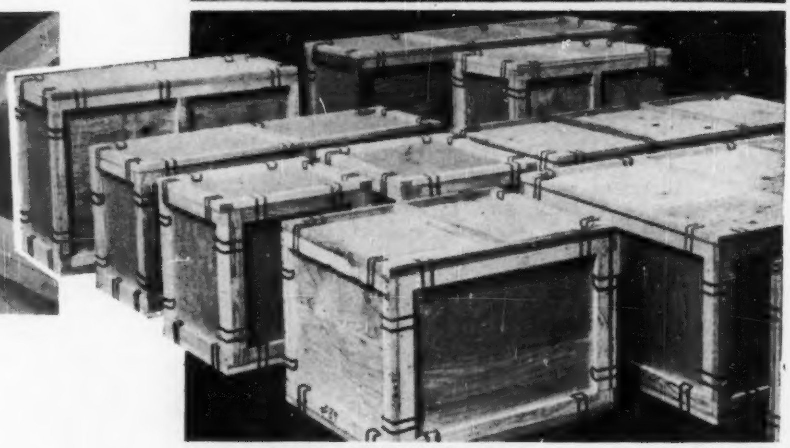
Laboratory results at the Silicones Division, Union Carbide Corporation, Tonawanda, N. Y., indicate that other members of this new family, such as higher-durometer or low-temperature varieties, can also be made.

Although they show no stickiness to the touch, cured parts—mold curing, continuous vulcanization, hot-air cure, or even oven cure can be used—made from these fusible compounds will adhere on contact; they will also adhere to other silicone rubbers if applied under tension. Actual fusion of the rubber will occur slowly at room temperature. The application of heat or pressure will greatly accelerate the fusion into a solid mass. After fabrication, the parts may be dusted with mica or silica to provide a nonsticking surface. With the use of silicone primers, the fusible compounds give excellent bonds to metals and fabrics.

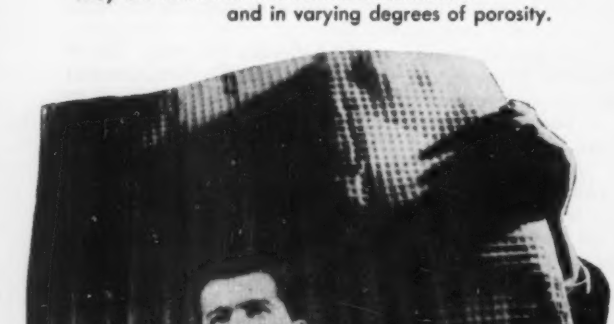
PHOTO BRIEFS

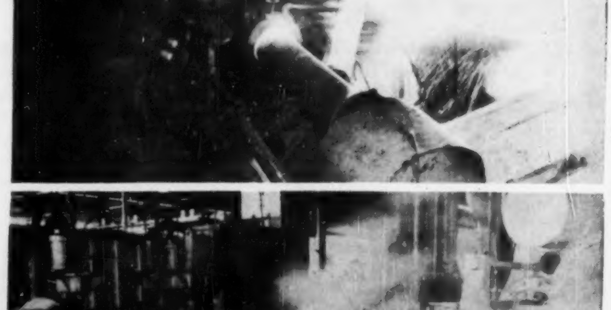


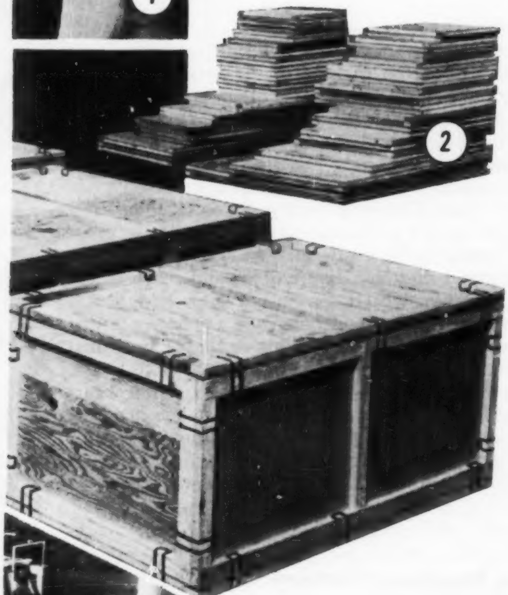




Filter Cloths
woven of monofilaments of Fortiflex, the new Celanese rigid polyethylene, have been introduced by Reeves Bros., Inc., for use in wet chemical and electroplating processes. Inert in a wide variety of chemical media, the filter cloths have a much longer life than those made from conventional yarns such as cotton, and are stronger and more heat resistant than those made from other plastic monofilaments. They are available in different constructions and in varying degrees of porosity.







Fan Certification

1 A centrifugal-fan test at the University of Detroit's Test Laboratory, which has been approved by the Air Moving and Conditioning Association as a qualified neutral lab for certifying air-moving products for the Association's new "Certified Rating Program."

Reusable Knockdown Boxes

2 Shipping contciners from modular interchangeable panels of cleated plywood are produced in 159 different shapes and sizes without nails from 47 panels made by NaVan Products, Inc., Santa Monica, Calif. Rapid assembly and disassembly with Klimp fasteners make it possible to return panels for reuse, and little space is required for storage.

Metals Processing

3 High quality ferrous-alloy castings by any of the various molding techniques—sand, shell, ceramic, or centrifugal—are available in sizes up to 5500 lb in the Foundry Unit of the Buffalo, N. Y., plant of the Metals Processing Division of the Curtiss-Wright Corporation. New and advanced metal-processing techniques and products were demonstrated at a recent preview for the technical press.

4 A 46-ft. length of heavy-wall tubing emerges from the 12,000-ton extrusion press, world's largest, at Curtiss-Wright's Metals Processing Division. The hot working of the extrusion process results in superior transverse properties and a high ratio of tensile properties to ductility. Tubing is available up to 20 in. OD with virtually no restriction on wall thickness.

Canned Motor Pumps

5 Five "canned" motor pumps to be installed in the land-based prototype pressurized-water atomic engine for a nuclear-powered naval surface vessel are near completion at the atomic equipment department plant of Westinghouse Electric Corporation at Cheswick, Pa. Each stainless-steel Inconel-canned graphitar-bearing pump weighs over 25,000 lb, is more than 6 ft high and 2½ ft in diam, and is rated approximately 850 hp.

Engineering Progress in the British Isles and Western Europe

J. FOSTER PETREE
European Correspondent

EUROPEAN SURVEY

Measurement Standards

When the International Committee of Weights and Measures meets in 1958, its agenda will contain a recommendation that the meter shall be defined as equal to 1,650,763.73 times the wavelength *in vacuo* of the orange-red radiation of krypton-86. Thus does the development of atomic science come to the aid of the engineer and the scientist in search of absolute standards of measurement, and advance to an accuracy probably never contemplated by its originator, the conception of J. Babinet, 129 years ago, that the wavelength of light might serve as a natural standard of length.

This was one of many such links between the work of the research physicist and the practical engineer to which attention was drawn by Dr. H. Barrell, Superintendent of the Metrology Division of the National Physical Laboratory, Teddington, England, in the 1957 Sir Alfred Herbert Paper which he presented in London to the Institution of Production Engineers. Remarkable as it is, however, as evidence of the accuracy now attainable in the measurement of length, the precision with which time can be determined must seem, to the engineer accustomed to think in terms of direct measurements, to be even more impressive; for time measurement depends on observations of the movement of bodies in the solar system. To be able to detect variations in the rate of rotation of the Earth in terms of a thousandth of a second is an accomplishment which the ordinary man may well find hard to grasp.

The mean solar second derived from the Earth's rotation, though, as Dr. Barrell said, the more convenient for most scientific and industrial purposes, may not be quite so precise as the second derived from the tropical year, which requires for its determination astronomical observations extending over a long period of time. But it would seem that it is not likely to mislead anyone very seriously, for it is found practicable to maintain the broadcast time signals from the Royal Greenwich Observatory uniform over a whole year within about 5 parts in 1000 millions and, by those means, to keep the quartz clocks at the National Physical Laboratory within a variation of 0.00001 sec per day.

Universal Miller

The word "universal," as applied to machine tools, is sometimes overworked, but not in the case of the Schaublin 53 as lately redesigned by the makers, Schaublin S.A., of Bevilard, Switzerland. The milling spindle is rotatable universally on the end of the cylinder, which can be projected or retracted to adjust the overhang to the minimum; and, as its axis is offset from that of the cylinder, it can be used in high or low positions to right or left of the vertical axis of the machine, and at any angle to it. The spindle is double-ended, one end taking tools with Nos. 1, 2, or 3 Morse tapers and also large milling cutters, and the other end having a collet chuck for gripping tools with cylindrical shanks. The spindle is driven through a multiple-disk clutch, and there are 18 speeds. The table, which can be swiveled 45 deg, has power feeds in all three directions, with a separate motor and push-button control for rapid movements. Lubrication is automatic to all turning parts, by oil bath to the carriage members and by hand pump to the slide bearings. A wide range of accessories enables the machine to be used also for drilling, boring, dividing, screw-cutting, slotting, cam milling, and the cutting of spur, helical, and straight bevel gears, and worm-wheels.

Hobbing Machine Factory

In the May, 1957, issue of Mechanical Engineering, page 471, reference was made to a transfer mechanism for the Churchill-Cleveland "Rigidhobber" made by Churchill Gear Machines, Ltd., Newcastle-upon-Tyne, England. At that time and for some ten years previously the firm had been operating in a former locomotive shop which they were steadily outgrowing, but a few months later they were able to move into a new factory at Blaydon-on-Tyne, on the other side of the river. This has been built to suit their own requirements and is a single-story building of reinforced concrete, with a floor area of 94,000 sq ft, divided into four longitudinal bays. The roof is of multibarrel vault design, two bays being 36 ft high and two 24 ft. The whole of the walling is glazed from 5 ft above floor level to the roof. The whole factory, which is carried on piles and has a concrete floor varying in thickness from 8 in. to 3 ft, was constructed in nine months from the placing of the contract, and the entire plant was transferred from the old works, with a number of new machines added, within two weeks. As the shift was made at the time when the works would normally have been closed for the summer vacation, the actual working time lost was only half a day.

The move took place when the firm was erecting the

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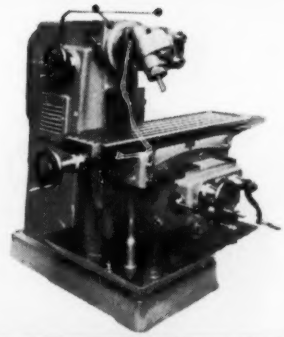
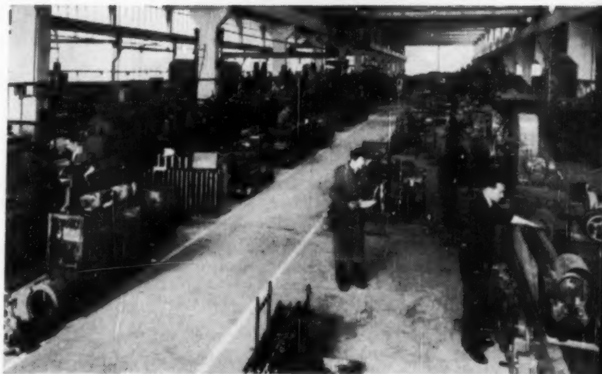
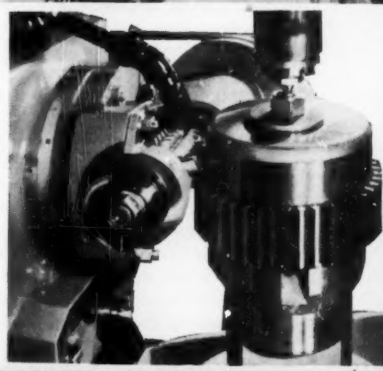
prototype of a new model "Rigidhobber," the S.1418, which they have since put into production. Using a 3-in-diam hob, it can take blanks up to 16 in. diam. To insure accuracy, the index worm-wheel diam is the same as the maximum diam of blank, 16 in. The maximum rated diametral pitch is 4. The maximum hob speed with a 3:1 hob head is 500 rpm; with a 4:1 hob head, 360 rpm. The index and feed change gears give 81 ratios and a range from 20 to 120 teeth (10 D.P.). The hob head swivels 90 deg to either side. The vertical feed range is from 0.006 to 0.25 in. per revolution of the work, and the infeed of the hob slide from 0.040 to 59 ipm. The work head has a rapid traverse rate of 42 ipm and the hob slide, 59 ipm. The main drive motor is of $7^1/_2$ hp and runs at 1440 rpm, but the design provides for the fitting of a more powerful motor if this should be required. The various motions are operated hydraulically, the oil pump having a capacity of about 16 U.S. gpm. The coolant pump delivers 33 gpm. The lubricating oil supply to the work head is 13 gpm.

The machine cycle is fully automatic, the tailstock, hob slide, and work head all being sequentially controlled. A rotary selector switch enables the circular, square, and direct infeed cutting cycles to be obtained, and also provides for setting up. The protective devices include overtravel limit switches and both electric and hydraulic interlocks. The electrical controls and relays are housed in a cabinet with a self-sealing door; an isolating switch interlocks with the door catch. "Jog" buttons are fitted for use in setting, but the current is cut off from these when the selector switch is placed to "Set." The amount of hob-slide movement and the change-over from "rapid" to "feed" are controlled by microswitches, and another microswitch in the hydraulic tailstock insures that the machine cycle will not commence unless the tailstock is correctly positioned. During cutting, the hob slide is hydraulically clamped against a stop by a force of over 4000 lb. The hob arbor is also hydraulically clamped and will remain so even if the hydraulic pressure should fail.

In a demonstration run in which first-speed transmission gears for a motor vehicle, in EN.18C steel (1 per cent Cr) of 45 tons psi tensile strength, the cutting time was $7^1/_2$ min per pair. The gears had 34 teeth, 5/7 D.P., with 20 deg pressure angle. The cutting speed was 220 rpm (230 fpm) and the vertical feed (climb-cutting against the work spindle) was 0.03 in. per revolution of the work. In this instance the machine was hand-fed and operated, but facilities are provided for semiautomatic and fully automatic tooling setups.







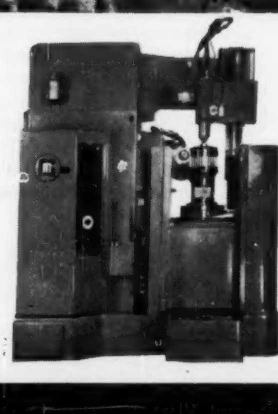


Photo captions: ***Top to bottom.***

Universal milling machine, Schaublin 53 model redesigned. Milling spindle is rotatable universally on the end of the cylinder.

Machine bay, one of four longitudinal bays, of new hobbing machine factory built by Churchill Gear Machines, Ltd.

Close-up view of hob head and work on "Rigidhobber" manufactured at the above plant. Using a 3-in. diam hob, it can take blanks up to 16-in. diam.

Aerial view of new hobbing machine factory erected by Churchill Gear Machines, Ltd., at Blaydon-on-Tyne, County Durham, England. Roof is multibarrel vault design.

View of operating side of Churchill-Cleveland "Rigidhobber" made at above plant. Machine cycle is fully automatic, the tailstock, hob slide, and workhead are all sequentially controlled.

Substance in Brief of Papers Presented at ASME Meetings

M. ZANFARDINO
Staff Editor

ASME TECHNICAL DIGEST

Gas Turbine Power

Operational Experience With Auxiliary Gas Turbines for Aircraft ....57—A-121

By C. H. Paul, Assoc. Mem. ASME, AiResearch Manufacturing Company of Arizona, Phoenix, Ariz. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Gas turbines find many auxiliary applications in aircraft. A gas turbine can produce large quantities of low-pressure air and shaft power.

Bleed air from the compressor of the gas turbine can be extracted from the machine by means of a shutoff valve and can be bled into a manifold system within the aircraft. This system can then serve various functions. It accomplishes ground check-out of the air-turbine-driven generator pack. The pneumatic supply feeds the air-cycle-cooling-turbine system. When the main engines are to be started, this supply also can be fed to an air-turbine starter mounted on the main engines and thus produce horsepower necessary for the starting operation. An additional pneumatic service is deicing or snow removal.

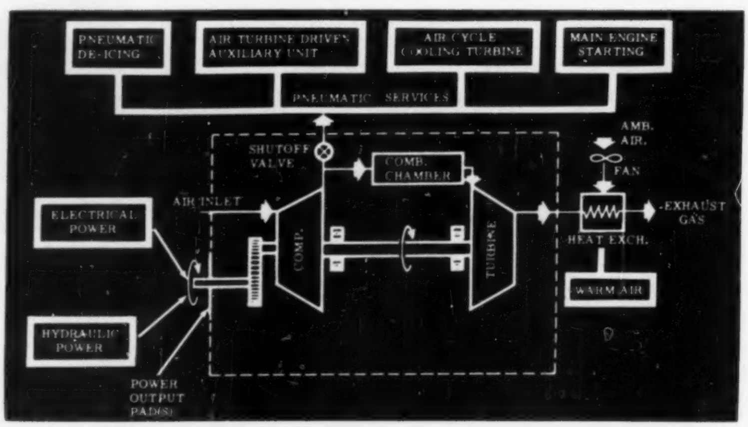
Shaft power produced by the gas turbine provides auxiliary support to the aircraft-electrical and/or hydraulic power systems.

Operational experience with auxiliary gas turbines is recorded in this paper. The units considered were developed and manufactured by AiResearch Manufacturing Company, and 30 per cent are in the 100-hp size class with 70 per cent in the 250-hp size class.

In order to minimize operational error and installation problems, and maximize safety of operation, certain basic design parameters had to be included. The controls system is completely automatic. The use of well-proved design factors on the compressor and turbine rotating components have indicated that a high margin of safety also exists on these assemblies. For ease of installation and maintenance, the components of the gas turbine are grouped and left uncovered for accessibility.

The more recent production version has a single combustion chamber which can be inspected readily by removing a single clamp so that the flame tube, fuel nozzle, and spark plug can all be removed, inspected, and/or replaced within a 5 min period. In addition, the compressor inlet has been enclosed in a plenum chamber to facilitate getting air under ambient-temperature conditions into the compressor inlet rather than recirculating hot air from warm parts of the machine into the compressor and thus reduce the performance. The cooling-air-fan inlet has been separated from the compressor inlet for fire safety reasons. A fuel cluster and an oil cluster which in themselves are bolted onto the accessory case, are integral components which may be removed, bench-tested, and easily installed or adjusted as it is placed on the machine.

Operational experience in the area of installation is discussed in relation to requirements for airborne units and ground power packages. Attenuation of sound is considered also in relation to gas-turbine packaging.



Compressor Development for Small Gas Turbines..........57—A-258

By S. D. Hage, Assoc. Mem. ASME, W. B. Anderson, V. W. Van Ornum, R. Johnson, and R. W. Flickinger, Boeing Airplane Company, Seattle, Wash. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Compressor development that accompanied a program of small gas-turbine development is outlined. Initial investigation revealed that considerations of low cost, reliability, and competitive fuel consumption pointed to aerodynamic refinement of a radial compressor, having a minimum number of compression stages.

A dynamic compressor is essentially a combination of moving and stationary fluid-diffusing channels. A small efficient compressor results from making the optimum rotor design to obtain the highest structurally safe tip speeds, the lowest possible product of wetted surface and unit shear stress, the lowest possible clearance leakage, the lowest possible shock loss, and the prevention of boundary-layer separation.

Data for more than three hundred compressor maps have been measured. Specific fuel consumption has been calculated using standard engine losses, measured

turbine expansion efficiencies, and the optimum pressure ratio and compression efficiency from compressor maps. Actual specific fuel consumption points from engine dynamometer tests are also shown.

Effects of Stage Characteristics and Matching on Axial-Flow-Compressor Performance.......57—A-139

By Aubrey Stone, Solar Aircraft Company, San Diego, Calif. 1957 ASME Annual Meeting paper (in type; to be published in *Trans. ASME;* available to Oct. 1, 1958).

Performance of an axial-flow compressor is a function of the characteristics of the individual stages and their relative matching.

After considering the basic stage characteristics, this paper analyzes the operation of an actual compressor by first considering the general trends in relative stage matching as shown by an idealized procedure. The results of the idealized case are examined in the light of the effects of Mach number and stage interaction existing in an actual compressor as indicated by test experience. The factors governing major performance parameters are discussed.

The use of measured stage-performance data in analyzing compressor performance is next considered, followed by a review of development problems and some possible solutions.

Getting a Civil Turboprop Into Service...............57—A-132

By B. G. Markham, Bristol Aero-Engines Ltd., Bristol, England. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Flight-testing and route-proving of a Bristol Proteus engine have uncovered two major problems. A prototype aircraft was lost as the result of a reduction-gear failure and action resulting from it. Unexpected difficulties arose when flying through ice-crystal clouds.

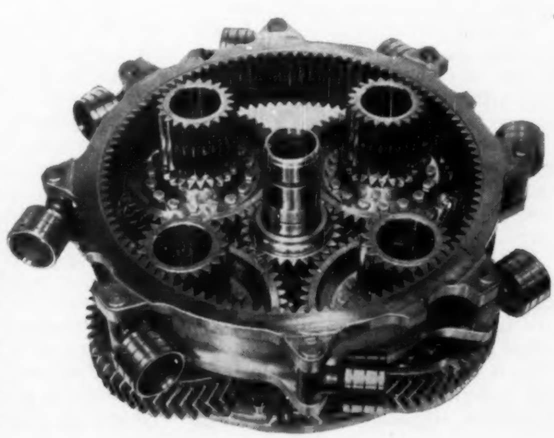
Reduction-gear failure was attributed to wear resulting from an unusual vibration. The vibration seems to have been associated with unusual conditions of operation speed for a straight tooth gear. The self-sustained vibration due to cyclic changes in stiffness caused by changes from one-tooth loading to two-tooth loading was eliminated by the use of helical gears.

The accident to the prototype aircraft focused attention on overspeed protection. The primary means of protection which was adopted is based on the immediate fall in engine torquemeter pressure in the event of a drive failure. A drop in torquemeter pressure operates a switch and closes a contact which shuts the high-pressure fuel cock. A centrifugally operated switch is fitted to disarm the system at speeds below 10,500 rpm, above which speed acceleration stalls do not occur.

To protect the engine against power turbine overspeed below 10,500 compressor rpm, a second centrifugal switch, which closes at 10 per cent overspeed, energizes the relay which operates the shutoff cock. This switch will by itself give adequate protection up to about 3000 shp, but it gives only marginal protection at take-off power (3650 shp).

Immediately after the accident to the prototype a review was made of fire-protection arrangements. Tests clearly demonstrated the inherent safety of a turbine-engined installation from the point of view of fires in the air. This greater safety is attributed to the lack of large cooling air flows in such installations, and to the smaller amount of lubricating oil required.

◀ Applications of auxiliary gas turbines in aircraft



▶ Helical reduction gear with high-speed train eliminates vibration due to cyclic changes in stiffness caused by changes from one-tooth loading to two-tooth loading. Reduction gears of this type are being employed in turboprop engines.

Aerodynamic Development of a Turbojet Engine........57—A-127

By G. H. Pedersen, Curtiss-Wright Corporation, Clifton, N. J. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Aerodynamic development of a turbojet engine actually begins before the final design is approved and set to detail drawings. Plans are set forth at that time as to expected increases in performance attributable to the advancing state of the art, and the design is usually made on a very firm basis knowing the performance is very reasonable and some margin for future development is present, the magnitude of which is a function of company policy. It must be realized that the investment by both the military and engine builder is tremendous and as such the project must be worthy of the efforts. This leads to the fact, an engine must have a future for many years to come and this future can best be secured by continued development. Aerodynamic development of an engine covers a very broad field and many subjects. Some high lights of an engine-development program are reported.

A Simple Method of Estimating the Reynolds Number Effects on Aircraft Gas-Turbine Engines Operating at High Altitudes...57—A-157

By R. W. Pinnes, Bureau of Aeronautics, Department of the Navy, Washington, D. C. 1957 ASME Annual Meeting paper (in type; to be published in *Trans. ASME;* available to Oct. 1, 1958).

Altitude performance of an aircraft gas-turbine engine is usually estimated by generalizing sea level data. Sufficient altitude test data have now been obtained to demonstrate that this method is not entirely valid. One of the primary reasons for the deviations from the generalized data is the Reynolds-number effect.

In this paper, an attempt is made to establish a simple method for estimating correction factors for these Reynolds-number effects, for both turbojet and turboprop engines. These correction factors are based on an empirical correlation of some available test data by means of an "effective Reynolds-number diameter" parameter.

The paper (*a*) discusses the general problem, (*b*) reviews the available test data, and (*c*) recommends correction factors for each of the cases considered. In the last analysis, an altitude calibration of each specific engine is still required to establish accurate altitude data. However, in the absence of any better information, the curves established may be used to provide preliminary estimates.

The Industrial and Marine Applications of Lycoming Gas Turbines ....57—F-38

By K. A. Austin, AVCO Manufacturing Corporation, Stratford, Conn. 1957 ASME Fall Meeting paper (multilithographed; available to July 1, 1958).

Light-duty industrial gas turbines have a range from 250 to 3000 hp with a specific weight of about one pound per horsepower. Gas turbines can only expect to be accepted for those applications where they show advantage. A representative list of such applications follows: Aircraft support equipment; oil field mobile servicing equipment; small, high speed, short-range marine craft; light-weight stand-by and limited service generator sets; off-highway haulage vehicles; very large earth-moving equipment; high-capacity, fire fighting equipment; light-weight emergency pumping sets.

A short survey of the factors that govern the market prospects for light-duty industrial gas turbines is given in this paper. The present Lycoming range of shaft turbines is briefly described and details are given of an early marine application of the Lycoming T-53 engine.

Boiler Feedwater Studies

The Effect of Mechanical Factors on Condensate-System Corrosion..........................57—A-183

By R. G. Dalbke and J. F. Wilkes, Mem. ASME, Dearborn Chemical Company, Chicago, Ill. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Corrosion in steam-condensing and condensate-return systems is a continuing problem at industrial plants, government installations, in hotel, office, institutional, and other buildings. Material costs and labor charges for replacement of corroded piping or repair of damaged equipment are appreciable. If condensate lines are buried or installed in walls of permanent structures, replacement costs may be greater than those of the original installation. Interruption in operations also is costly; shutdown of major equipment may be required while damaged condensate piping is being replaced. Corrosion products carried back to boilers in condensate may deposit on heat-transfer surfaces, causing metal failures or localized corrosion. Build-up of metallic oxides in condensate systems fouls steam traps, valves, and reduces flow capacity.

Typical steam collapse-cavitation failure resulting from cold-water injection in a high-pressure return line

Dissolved oxygen and carbonic acid are basic corrosion causes, but design and operating conditions also contribute to condensate-system damage. Oxygen and carbon dioxide in steam are minimized by proper feedwater pretreatment, but may enter condensate-return systems through vents, air leaks, or raw-water injection. Volatile amines neutralize carbonic acid in condensate; filming inhibitors offer protection against both oxygen and carbonic-acid attack. Inhibitor performance can be nullified by carry-over, oil contamination, or steam collapse, which disrupt protective films. Unless steam traps and drains are sized and installed properly, sources of air inleakage eliminated, and other mechanical problems corrected, a corrosion-abatement program fails. This paper describes operating problems contributing to condensate-system corrosion and offers practical solutions.

Diet for Boiler Allergies. 57—A-257

By S. F. Whirl, Duquesne Light Company, Pittsburgh, Pa. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Chemical conditioning of boiler water assumes special importance when either the design or operation of a boiler presents critical problems. The effectiveness of a particular method, however, is limited by the severity of the conditions imposed by both design and operation.

Chemical conditioning is considered, stressing the advantages and limitations of the "co-ordinated phosphate-pH control method" of boiler-water conditioning.

The theory of the co-ordinated phosphate-pH method of protection against caustic attack is that, in the absence of caustic, there can be no caustic attack.

The fundamental principle, therefore, is to produce a boiler water incapable of concentrating caustic on evaporation, and yet containing sufficient alkalinity to afford good general corrosion inhibition. This is accomplished by maintaining in the boiler water bonded alkali metal phosphate alkalinity only. Thus any significant alkaline attack on the boiler metal necessarily will be limited to the relatively weak action of the phosphate salts as contrasted with the strong action of an alkali metal hydroxide—in most cases, sodium hydroxide.

Considered also are the use of auxiliary chemicals such as sulfite, hydrazine, alkalizing amines, and ammonia; and the numerous design and operation factors involved in the evaluation of any boiler-water-treatment method.

Ammonia and Hydrazine for High-Pressure Boilers.......57—A-248

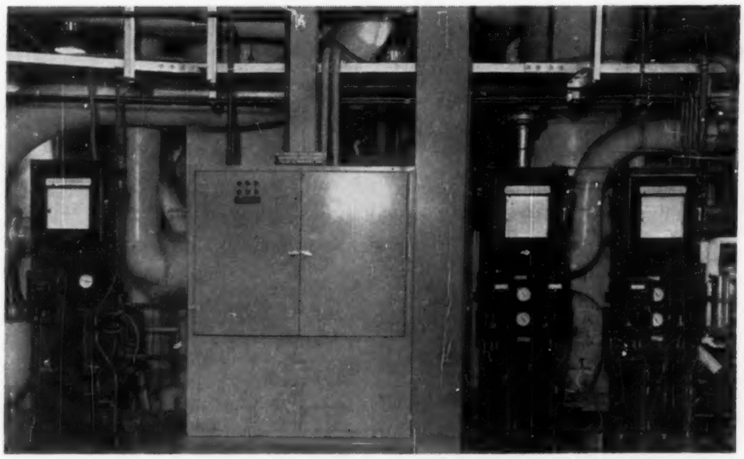
By R. I. Smith, Assoc. Mem. ASME, Public Service Electric and Gas Company, Newark, N. J. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Feedwater treatment in a steam-power plant is used to prevent corrosion and the formation of deposits in boilers, turbines, and other apparatus which may result in damage to the equipment or loss of efficiency. Deposits may be formed by impurities which enter the feed-water cycle or by corrosion products from within the cycle. Impurities may enter the system with make-up, condenser leakage, chemical treatment, or, as in the case of oxygen, with air in-leakage at points below atmospheric pressure. Theoretically, treatment is necessary only to compensate for the impurities which enter the cycle—if noncorrosive conditions can be maintained within the cycle. Chemical treatment, although considered beneficial rather than detrimental, is an impurity deliberately added to the system, and the present trend is to reduce the amount of such treatment to a minimum.

This trend recognizes the demands of the once-through boiler where only an infinitesimally small quantity of impurity of any kind can be tolerated and where no solids-forming compounds can be used for chemical treatment.

Six boilers in the Public Service Electric and Gas Company system which operate at pressures in excess of 2000 psig have been in service for periods up to two years,

with ammonia and hydrazine as the only water and steam-conditioning agents. This treatment method was adopted to reduce corrosion in the preboiler cycle and to minimize the possibility of turbine deposits by eliminating the addition of solids-forming chemicals to the boiler water. Results to date indicate that satisfactory conditions are being maintained throughout the boiler, turbine, and preboiler cycle with the ammonia-hydrazine method of treatment.



Hydrazine, oxygen, and hydrogen recorders at Burlington Generating Station of the Public Service Electric and Gas Company, Newark, N. J.

Ferrous Hydroxide—Solubility, Thermal Decomposition, and Role in the Corrosion of Iron 57—A-184

By P. D. Miller, J. J. Ward, O. M. Stewart, and R. S. Peoples, Battelle Memorial Institute, Columbus, Ohio. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Deposition of iron oxide in critical parts of feedwater and steam circuits of boilers and turbines is a manifestation of corrosion.

One major difficulty has been deposition on the stop and control valves of turbines to an extent that the valves become inoperable. Deposits also occur in pumps and heaters.

The cost of these difficulties to the industry has been great because of the necessity to replace damaged equipment, but perhaps even greater because of the necessity to reduce the load or to take equipment out of service. The cost of the latter has become particularly high as the size of the boilers and turbines has been increased.

Whether the iron oxide is formed in the place that the deposits are found or whether it is formed in one part of the system and carried in the steam or water to be deposited further along in the system has not been established. In addition, the reactions of iron and water that lead to the formation of the most prevalent scale, Fe_3O_4, are not defined.

Ferrous hydroxide is generally agreed to be an intermediate in the reaction of iron with water.

The decomposition of pure ferrous hydroxide at temperatures between 250 and 550 F has been measured. The data obtained show that the major decomposition products are hydrogen and magnetite and that the minor constituents are alpha iron and Fe_2O_3. The rate of decomposition is such that it is concluded that the decomposition of ferrous hydroxide is not the rate-controlling step in the iron-water corrosion reaction at temperatures above 250 F. The solubility product ${}^aFe(OH)_2 = {}^aFe^{++} \times a^2(OH)^-$ has been determined by four methods. The most reliable value appears to be 2.9×10^{-16}. The paper presents a part of the results of a program of research at Battelle under the sponsorship of the Edison Electric Institute.

Metals Engineering

Weld-Fabricated and Repaired Steel Castings for Nuclear Service ....57—F-37

By Sidney Low, Mem. ASME, The Chapman Valve Manufacturing Company, Indian Orchard, Mass. 1957 ASME Fall Meeting paper (multilithographed; available to July 1, 1958).

A rise in the number of military and commercial nuclear power plants has resulted in stringent demands being made upon producers of both austenitic stainless-steel and carbon steel castings. The nuclear power program is demanding a substantial tonnage of superb quality castings ranging in weight from a few pounds to many tons.

The designers and materials engineering groups engaged in the design and construction of nuclear power plants have been guided by the conservative safety concepts necessitated by the hazards peculiar to the nuclear power plant setup.

These conservative safety concepts have resulted in acceptance standards for steel castings that assure the purchaser of the most nearly perfect castings ever produced. Radiographic and penetrant oil-powder inspection procedures and acceptance standards have been promulgated to describe more accurately the desired quality of castings.

Both foundry and metallurgical engineers are well aware that while it is theoretically possible to produce a perfect casting, it is neither economically attractive nor practical to do so. The engineering approach is to produce as nearly a perfect casting as economically justifiable and then make the necessary weld repairs for the desired quality.

Certain specifications covering castings for nuclear-power-plant service have legislated against major weld repairs, necessitating the scrapping of castings containing defects beyond prescribed size limits. By inference, these specifications suggest that welding has a deleterious effect on the castings and results in a weakening which adversely affects their usability. This thinking might be further extended to discriminate against monolithic structures weld-fabricated from cast components.

Large cast cylinders and smaller castings for thermal shock tests were poured from heats of austenitic stainless steel (ASTM A351-52T, Grade CF8) and carbon steel (ASTM A216-53T, Grade WCB).

Short time elevated temperature tensile tests and smooth bar creep-rupture tests were conducted on both welded and unwelded test bars.

A thermal shock test was also run on the test bottle designed for this purpose. The test bottle contained simulated weld defects and a weld joint.

Air Pollution

Principles of Gas Cleaning........ ....57—A-270

By R. V. Kleinschmidt, Mem. ASME, Stoneham, Mass. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Practical development of gas-cleaning equipment requires a clear statement of the basic principles of cleaning gases.

The range of variables which enter gas-cleaning problems is extensive. Gases, liquid droplets, solid particles of varying size, and impurities which may change their phase or chemical composition with time, temperature, or other physical changes in condition, complicate gas-cleaning problems.

Removal of impurities from a gas requires development of relative motion of particles through the gas. Production of relative motion requires application of force to particles, and consumes energy. The means that may be employed to cause relative motion include: Electrostatic, magnetic, gravitational, and mechanical (filters) forces. Economic evaluation of a particular device is based on efficiency and energy consumed. Forces and resulting motions may be random or directed relative to the main gas stream, but finally must result in motion toward surfaces or regions from which particles may be separated from the gas stream.

There is no theoretical minimum energy required to separate discrete particles from a gas stream, such as there is for separating gaseous impurities. Most separation processes tend to be more effective when used for certain types or sizes of particles than for others.

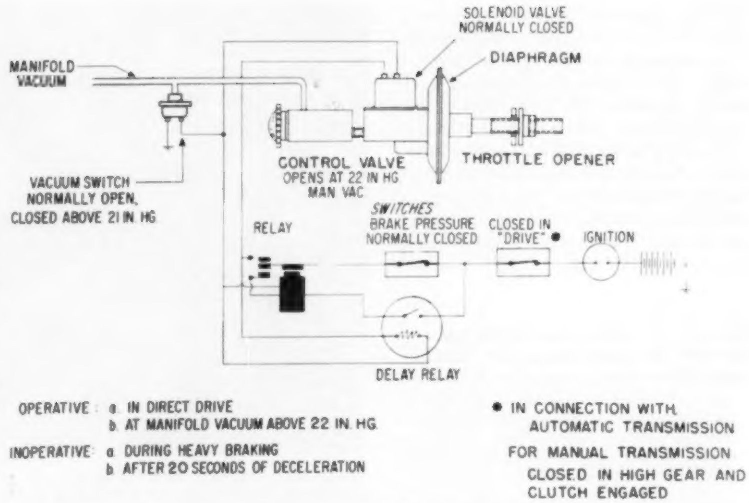
For efficient cleaning, all portions of gas must receive uniform treatment in so far as possible.

Gases which contain condensable or precipitating impurities must be allowed to complete condensation or precipitation before cleaning.

Particles of size in the order of 0.1 μ are the most difficult to remove by inertial and diffusional methods.

Specifications for gas cleaning should take into account the amount of impurity to be removed and size of particles.

Special properties of particles, such as electrostatic charges, wettability, and so on, must also be considered.



Control-circuit diagram of vacuum-control throttle opener. Device could be used to shut off fuel flow during deceleration and reduce hydrocarbon emissions from automobiles.

Engineering Problems in Controlling Automobile Exhaust Gases ....57—A-245

By W. L. Faith, Air Pollution Foundation, San Marino, Calif. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Automobile exhaust has long been suspected of being an important contributor to air pollution. The chief constituents of this exhaust, on a volume basis, are carbon dioxide, carbon monoxide, and water vapor. But on a smog basis, the chief pollutants are the much lower concentrations of unburned or partially burned fuel (essentially hydrocarbons) and oxides of nitrogen. There is considerable variation in hydrocarbon and oxides of nitrogen content among the several operating conditions of an engine.

Research and development on methods to control air pollution from automobile exhaust have been directed toward elimination of unburned fuel (hydrocarbons) and nitric oxide. The attack on hydrocarbons has been of a dual nature—improvement of combustion in the engine and burning excess fuel in the exhaust system. The status of these developments is described.

Less work has been done on nitric-oxide elimination, but two approaches to the problem are mentioned. It is concluded that exhaust-gas afterburners and nitric-oxide eliminators offer the most promise for control of motor-vehicle exhaust gas.

Process Industries

Innovations in Refuse-Incinerator Design...............57—A-220

By W. Raisch, Mem. ASME, Garden City, Long Island, N. Y. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Many novel features were incorporated in a refuse incinerator plant constructed for the town of Oyster Bay, Long Island, N. Y. The plant contains four furnaces, each of 125 tons per 24-hr-day capacity. Each furnace is equipped with a two-section hydraulically operated stoker having a combined area of 172 sq ft to achieve a burning rate of 60 lb of refuse per sq ft per hr. Under test, the results were found to be slightly more than 5 per cent above this rate. Each furnace has two pneumatically operated charging gates at the top, each 4 ft square, through which refuse is fed by overhead cranes. Each furnace has twin ash hoppers and ash-discharge chutes fitted with balanced gates directly underneath the stokers which discharge into an ash sluiceway. The stokers employed in these furnaces are of the semiautomatic type, which enable the operating crew to regulate the speed of burning so as to stay within a predetermined temperature range and to control the organic content in the ash.

The ash-removal system, one of the chief innovations, is an enclosed hydraulic sluiceway into which ashes may fall directly from the furnaces where they are almost instantly quenched and carried away by water to a large underground ash tank. Ashes are stored under water in this tank until such time as they are dredged out and loaded in a truck by means of a clamshell bucket operated from a portable crane.

The plant is almost entirely self-suffi-

cient. The burning of refuse naturally produces a considerable quantity of waste flue gases at temperatures approaching those in the furnaces. Theoretically, it is possible to produce an average of about $2^1/_2$ lb of steam from each pound of refuse burned. In that case, this plant, with its 500-ton rating, could conceivably furnish $2^1/_2$-million pounds of steam per day. The installation of boilers, piping, turbine, and auxiliaries to produce electric power was more than justified from several points of view. Boilers and power-generating equipment were therefore included. The two waste-heat boilers are of the Stirling H-type, each capable of evaporating and producing 13,000-lb of 250-psi steam per hr with ample reserve for 25 per cent overload.

The steam so produced is utilized in a De Laval steam turbine-electric generator unit of 400-kw rating which is more than ample to meet all power requirements of the plant as well as the requirements of other township buildings soon to be located on the same site.

Some of the power produced is utilized in driving a 60-hp deep-well pump of 500-gpm capacity which produces water from a well 490 ft deep. This water is used for all plant and sanitary purposes as well as fire hydrants on the site. The capacity of the well is more than ample to meet make-up requirements for the ash sluiceway system as well as all other plant uses. Every effort has been made in the design of this plant to minimize fly-ash discharge from the stacks even though no governing codes existed in the district at the time.

A central control station, a dust control system, and radiant heating are among the other features which combine to make this an efficient refuse-incinerator design.

Temperature Distribution in Fins and Other Projections, Including Those of Building Structures, by Several Procedures.....57—A-177

By C. F. Kayan, Mem. ASME, and R. G. Gates, Columbia University, New York, N. Y. 1957 ASME Annual Meeting paper (in type; to be published in *Trans. ASME;* available to Oct. 1, 1958).

Structural projections, involving surface heat flow engendering temperature variations along their length, are to be found in a wide variety of forms and shapes in equipment and structures associated with process engineering. They may be in the conventional form of simple homogeneous heat-transfer fins or other extended surface of broad nature in shape and purpose, on one hand, or, on the other hand, in a heterogeneous complex arrangement and built-up fashion of projections plus base, and as such found as segments of machines, equipment, and building or industrial structures representing heated or cooled enclosures. Among the enclosures would be process high-temperature ovens and housing structures in the heated realm, and cold-storage warehouses and refrigerated "environmental" chambers in the cooled realm, just to mention a few examples, and inclusive of both stationary and mobile units.

Such a range of application is typified in the cases discussed here. The analytical objective of interest may be represented either by a study of temperature variations, of heat-flow rates, or of both combined. The first is the major objective in this paper. Since orthodox methods of computation often prove cumbersome or otherwise inadequate, several additional alternative procedures are developed and reported on comparatively. Thus included (*a*) mathematical methods; (*b*) computational-numerical means; (*c*) electrical simulation approaches. In these attacks upon the problem, the resistance concept of heat flow proves to be a useful tool, hence particular emphasis devolves upon exploration in the rheogenic vein.

In the present study, the subject is first developed in terms of the more conventional and obvious formal application of extended-surface projections generally referred to as "fins," i.e., pure simple extended surface, and then—on a broader basis—in terms of complex-composition structural forms.

Continuous Pump Control by a Dual Pneumatic Circuit..57—A-53

By E. R. Forman, Assoc. Mem. ASME, and W. R. Jensen, Moore Products Company, New York, N. Y. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

A method of liquid-level pump control (that is believed to be more flexible than previous arrangements) has been installed at the new Penns Grove, N. J., Sewerage Authority Treatment Plant. Switchover and loading of the pumps are accomplished by a dual pneumatic proportional-band circuit, coupled with electrically operated pumps. The system uses two operating pumps and one stand-by. Its principle can be used with equal ease on systems which would require a pumping load distributed over more pumps. The system offers completely automatic control, with optional manual operation for any of the pumps, at any time. Any pump may be put "on stream" at any time.

This system achieves continuous automatic speed control that is proportional to the level in the wet well. Since the wet well acts as a surge tank, it evens out the flow to the rest of the sewerage treatment plant, resulting in more efficient operation and closer control of the treatment process.

The level-measuring device offers no explosion hazard. The pneumatic transmitter is completely isolated from the corrosive atmosphere in the wet well. No floats, cables, nor electrical contacts are used.

The control equipment is miniaturized so that it takes up little panel space.

The pump and motor life is greatly lengthened, since starting and stopping occur infrequently. The system is specifically designed to avoid any type of on-off operation. In the system of operating the small pump for low flows and the large pump for high flows, each unit performs in the most efficient portion of its pump curve.

The use of the pneumatically controlled variable-speed drive results in a variable pumping rate which is in proportion to the load. The motors operate at maximum electrical efficiency.

The suction pressure is maximum at the highest pumping rate, because the pumping rate is in proportion to the level in the wet well.

The load can be distributed on the pumps in any desired pattern.

The system is easily adjusted and operated by plant personnel.

The Third Law of Thermodynamics—A Half-Century Appraisal of the Nernst Heat Theorem...57—A-185

By J. H. Potter, Mem. ASME, Stevens Institute of Technology, Hoboken, N. J. 1957 ASME Annual Meeting paper (in type; to be published in *Trans. ASME;* available to Oct. 1, 1958).

Modern process engineering operates against a backdrop of applied science developed largely from fundamental thermodynamics. At the present time there is great interest in low temperature technology, and much speculation in the area of cryogenics. In this sphere the Third Law of Thermodynamics is of paramount importance.

Fifty years have passed since Nernst formulated his "New Heat Theorem," which he subsequently referred to as the "Third Law of Thermodynamics." The several statements of the theorem are examined in the light of classical thermodynamics, quantum considerations, and recent low-temperature experiments. The limitations under which the heat theorem may be considered a basic scientific law are cited.

The Third Law of Thermodynamics has

won an established place among the fundamental scientific laws.

The unattainability of absolute zero temperature constitutes one of the forms of the Third Law of Thermodynamics. Two statements of the unattainability principle are cited below:

"It is impossible to devise an arrangement, by which a body may be completely deprived of its heat, i.e., cooled to the absolute zero." (Nernst)

"It is impossible by any procedure, no matter how idealized, to reduce the entropy of a system to its zero-point value in a finite number of operations." (Zemansky)

The Third Law may also be stated in terms of the behavior of entropy. Two recent formulations are given:

"The entropy of all factors within a system which are in internal thermodynamic equilibrium disappears at absolute zero." (Nernst-Simon)

"At zero temperature a system may assume several states having less entropy than all other states." (Keenan)

Product and Process Improvement Through Statistical Engineering....
....................57—A-221

By C. W. Carter, Mem. ASME, Rath and Strong, Boston, Mass. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Statistical engineering is set forth as a means of alleviating the shortage of engineers, that is, it may be employed to increase the productivity of each engineer.

That an engineer may increase in productivity through the use of planned statistically designed experimentation may be summarized thus: (*a*) More information is obtained for the same amount of effort. (*b*) More meaningful test results are less likely to be misleading. (*c*) The relative importance of various causes is pointed up, thus avoiding extra and oftentimes needless work and expense.

There are four principles or postulates which are basic to the statistical-engineering approach:

1 That maldistribution of causes and effects are found in most problems.

2 That probability of occurrence can be defined mathematically if relevant data are available.

3 That variation can be controlled.

4 That experimentation can be much more effective when statistically designed.

It is believed that application of these principles by statistical engineering analysis will result in improvement of product, process, and costs. Its role in bringing about greater engineering productivity is limited only by one's understanding and imagination in putting it to work.

Properties of Steam

An Instrument for the Measurement of the Viscosity of Steam and Compressed Water.........57—A-237

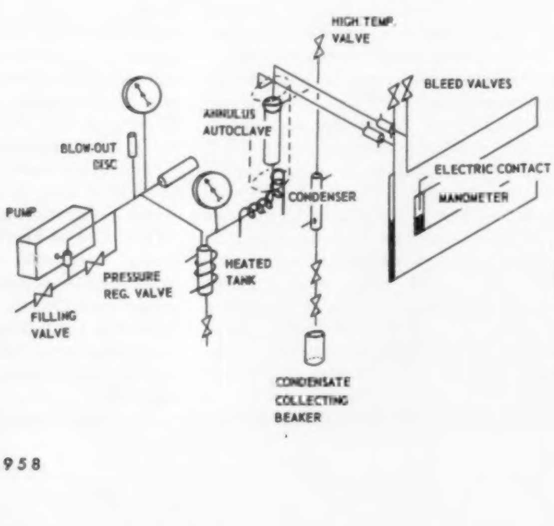
By J. Kestin, Mem. ASME, and J. R. Moszynski, Brown University, Providence, R. I. 1957 ASME Annual Meeting paper (multilithographed; to be published in *Trans. ASME;* available to Oct. 1, 1958).

An instrument designed for the measurement of the viscosity of steam and compressed water is described.

The instrument consists of a high-pressure bomb made of type 347, 18-8 stainless steel, sealed with the aid of tiebolts made of Inconel X and provided with a synthetic sapphire, Bridgman-type window. The oscillating system, a free disk, a free sphere, or a disk confined between two plates, is enclosed in the bomb and carries a reflecting mirror on a stem. The bomb is mounted on a titanium-carbide ball bearing and is enclosed in an automatically controlled heater surrounded by a manually controlled radiation shield. The bomb is filled with water under a vacuum. Depending on the final state required, the water may be pressurized from outside, or steam may be raised in it by heating.

The oscillation is started by rotating the bomb on its bearing, and is observed by a telescope which is trained on a precision back-lighted scale through the mirror which oscillates with the suspension system. Temperatures are measured with the aid of calibrated thermocouples, and pressures are measured with a set of precision Bourdon gages. Time is measured by an electronic counter operated manually, or by a high-precision stop watch.

At every step, great care is taken in achieving exact alignment and a high degree of precision.



Schematic drawing of apparatus for the study of viscosity of steam

Thermal Diffusivity of Gases as Determined by the Cyclic Heat-Transfer Method.......57—A-193

By W. B. Harrison, W. C. Boteler, and S. C. Barnett, Georgia Institute of Technology, Atlanta, Ga. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

A program for extending the data on physical properties of steam to high temperature and pressure, proposed that thermal diffusivities of steam be determined by a cyclic heat-transfer method. This paper describes the theory and apparatus which are being employed to demonstrate the feasibility of the method with nitrogen and other gases.

Only preliminary data are available at the present time and they are not sufficiently complete in scope to justify any conclusions or recommendations.

Equipment for the Study of the Viscosity of Steam........57—A-222

By T. W. Jackson, Mem. ASME, and F. A. Thomas, Jr., Mem. ASME, Georgia Institute of Technology, Atlanta, Ga. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Equipment built by the Georgia Institute of Technology for use in determining the viscosity of steam at temperatures between 212 and 1200 F and at pressures up to 5000 and possibly 10,000 psi is described.

In order to give some general information on the parameters or dimensions to be encountered using the annulus vis-

cosimeter for steam, experience in using an annular test section is given.

The system for determining the viscosity of steam was the annular transpiration method and is described.

Apparatus for the Experimental Study of the Thermodynamic Properties of Water.........57—A-266

By H. H. Reamer, G. N. Richter, W. M. DeWitt, and B. H. Sage, California Institute of Technology, Pasadena, Calif. 1957 ASME Annual Meeting paper (multilithographed; to be published in *Trans. ASME;* available to Oct. 1, 1958).

As part of an investigation of the properties of water at elevated temperatures and pressures, equipment was designed to investigate both the Joule-Thomson coefficient and the isothermal enthalpy-pressure derivative. In order to obtain Joule-Thomson data, the fluid was circulated through a porous alumina thimble under conditions closely approximating constant enthalpy. Measurements of the change in temperature for a known change in pressure were made. The second set of measurements involve the evaluation of the rate of electrical energy addition necessary to keep the outlet temperature of the fluid the same as that at the inlet of the thimble, while steady flow occurs at a known rate. From the latter data the isothermal enthalpy-pressure coefficient can be obtained. Measurements of this coefficient were not made at states for which it has a positive value.

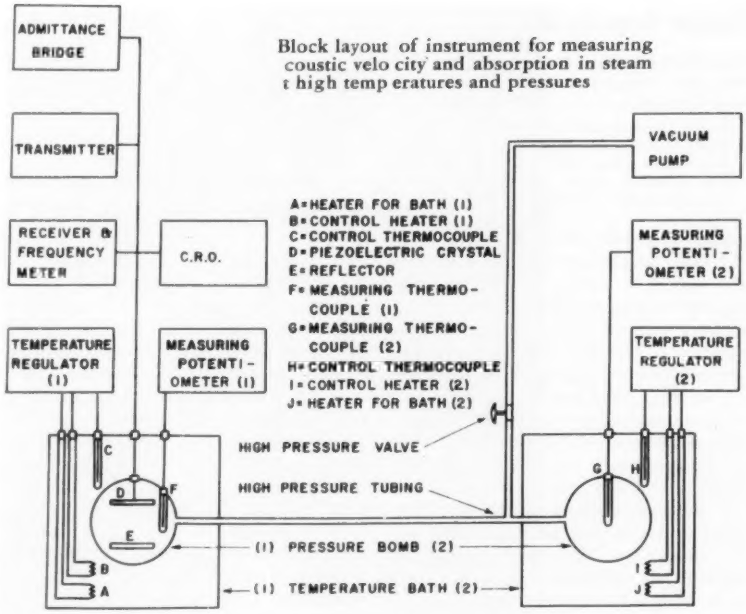
This experimental program is directed to the study of these coefficients at about temperatures between 400 F and 1500 F at pressures up to 15,000 psi or to a specific weight of the fluid such that the coefficients approach the inversion point.

The 1957 Status of Steam Properties ....57—A-228

By F. G. Keyes, Mem. ASME, Massachusetts Institute of Technology, Cambridge, Mass. 1957 ASME Annual Meeting paper (multilithographed; to be published in *Trans. ASME;* available to Oct. 1, 1958).

The Philadelphia Conference on steam-properties research held in September 1954, thirty years after the informal Harvard meeting which led to the organization of the first international steam research effort, marked the beginning of another international effort seeking to extend the known limits of steam properties to higher pressures and temperatures

The third conference in 1934 resulted in a definitive International Skeleton Steam Table accompanied by "tolerances" which served to define an "International Table." The limits of tabulated pressure in 1934 were 5000 psia and for temperature 1032 F. The 1954 Philadelphia meeting set the limits at 15,000 psia and 1500 F.



Block layout of instrument for measuring coustic velo city and absorption in steam t high temp eratures and pressures

The difficulties of accurate measurement attending the extensions in pressure and temperature are formidable, partly because steam is increasingly active chemically as pressures and temperatures mount and also because the accurate analytical formulation of properties to the high limits set has never before been accomplished for any substance.

The new steam table must exhibit, in addition to tabulations of equilibrium thermodynamic quantities, tabulated information for thermal conductivity, viscosity, and Prandtl numbers over the pressure and temperature range. Tabulations of standard specific heats should also appear and, of course, adequate information on relaxation time from velocity of sound measurements or perhaps also from other methods of measurements.

The Acoustical Properties of Steam ....57—A-190

By R. B. Lindsay and D. D. Eden, Brown University, Providence, R. I. 1957 ASME Annual Meeting paper (multilithographed; to be published in *Trans. ASME;* available to Oct. 1, 1958).

A method for the study of acoustical properties of steam at temperatures up to 600 C and pressures ultimately up to 1000 atm is outlined in this paper.

The aim of the investigation was to calculate the second virial coefficient in the equation of state from the velocity values, and to search, with the help of observed attenuation, for possible relaxation mechanisms involving states of vibration and rotation of the water molecule.

Design and construction of a fixed-path acoustic interferometer with associated equipment for measuring the temperature dependence of ultrasonic velocity and the sound-attenuation coefficient as a function of temperature and pressures are presented.

The method for measuring acoustic velocity and attenuation used in this investigation is based on the employment of a small fixed-path interferometer. This instrument consists essentially of a transducer in the form of a plane parallel plate of piezoelectric crystal material which is placed inside the chamber containing the gas to be studied at a fixed and accurately known distance from a precisely parallel reflecting plate.

To measure the velocity of sound with a fixed-path interferometer, one excites the crystal transducer into oscillation electronically at an appropriate and precisely known frequency. A stationary wave system is then created between the crystal and reflector. This produces a reaction on the transducer impedance which can be measured by an admittance bridge or similar device. As the frequency is altered, keeping the temperature and pressure constant, the impedance goes through a series of maxima and minima. From the frequency difference between successive maxima (or minima) and a knowledge of the plate separation, the velocity in the medium is immediately calculable.

Power Test Codes

A Condensate Flow-Measuring Section for Steam-Turbine Performance Testing..........57—A-206

By E. J. Rosecky and A. H. Gibeling, Mem. ASME, Allis-Chalmers Manufacturing Company, Milwaukee, Wis. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

Data on steam-turbine heat-rate tests obtained principally from instruments and meters installed as regular plant equipment indicated that a more positive measurement of feedwater flow was needed. It was felt that a dependable low-temperature condensate flow-metering section consisting of a primary element between adequate runs of straight pipe was needed. This metering section would necessarily have to be one that could be removed conveniently after the test program without interfering with plant operation and be recalibrated before further use. To take advantage of the multiple calibrations, it would have to be designed to cover a wide range of units, sized with comparable accuracy.

Orifice plates were selected as primary elements on the basis of the following considerations:

1 During a series of tests, it would be reasonably easy to change plates in the metering section. This advantage was considered desirable in order to obtain sufficient pressure differentials for good accuracy over the entire flow range.

2 An orifice plate, being comparatively small, could be kept under the surveillance of the test engineer, and thereby the chances for damage from mishandling while transporting, installing, or storing would be minimized.

3 Metering accuracy for calibrated orifice plates was considered to be on the same level as other available elements.

An 8-in. pipe size was selected as the average size of condensate piping for turbines of the 60,000-kw to 150,000-kw size range, with the plan in mind that adapter sections could be provided to accommodate the test section in a 6 and 10-in. piping system without a significant effect on the calibration results. A by-pass system has been included, making possible a change of orifice plates between runs without shutting down the unit.

From an analysis of the data compiled from tests on several units using the same or similar flow sections, as a basic measurement of flow, it would appear that flow measurements made by means of a calibrated test orifice section will reduce the magnitude of flow-metering errors.

Several essential instances where improvement can be made are pointed up when evaluating and comparing the collected data:

1 The interior pipe-wall surface in the orifice section should be capable of retaining its original surface finish for prolonged periods of time.

It is planned to accomplish this by either hard-plating the inner wall with a noncorrosive material, or by replacing the entire section with one made of such material.

2 It is desirable that some means be developed by which the manometer differential can be accurately integrated for the duration of the test period. Until such means are developed, it is proposed that the frequency of readings be increased materially.

Review of Practical Thermometry ....57—A-203

By R. P. Benedict, Westinghouse Electric Corporation, Philadelphia, Pa. 1957 ASME Annual Meeting paper (multilithographed; available to Oct. 1, 1958).

A historic résumé of the steps leading to a satisfactory concept of temperature from a thermodynamic viewpoint is presented. The International Temperature Scale is reviewed. The ideas of thermal response and thermal recovery are discussed briefly as they modify the steady-state, nonflow temperature concept.

Various practical means for realizing temperatures as defined by an internationally accepted temperature scale are indicated. Finally, the uncertainty associated with a temperature measurement is considered.

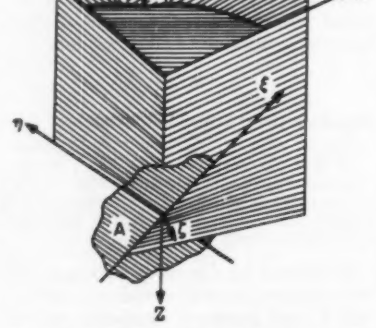
Applied Mechanics

Displacement Discontinuity in the Elastic Half-Space.......57—A-23

By Leif Rongved, Bell Telephone Laboratories, Murray Hill, N. J., and J. T. Frasier, The Pennsylvania State University, University Park, Pa. 1957 ASME Annual Meeting paper (in type; to be published in the *Journal of Applied Mechanics;* available to Oct. 1, 1958).

The Papkovitch functions for an arbitrary displacement discontinuity over a plane-bounded area in an infinite solid have been determined by Rongved. In this paper, the Papkovitch functions are determined for the same type of dislocation in a semi-infinite solid, where the plane of discontinuity has an arbitrary orientation with respect to the free boundary. The solution is given in terms of integrals containing the displacement discontinuity.

The solution is obtained by superposition. Starting with the solution for the infinite solid with a dislocation in the region $z > 0$, an appropriate state of stress is added to it such that the traction on the plane $z = 0$ vanishes. The state of stress added and the corresponding displacement must be continuous in the region $z \geq 0$ and must vanish at infinity.



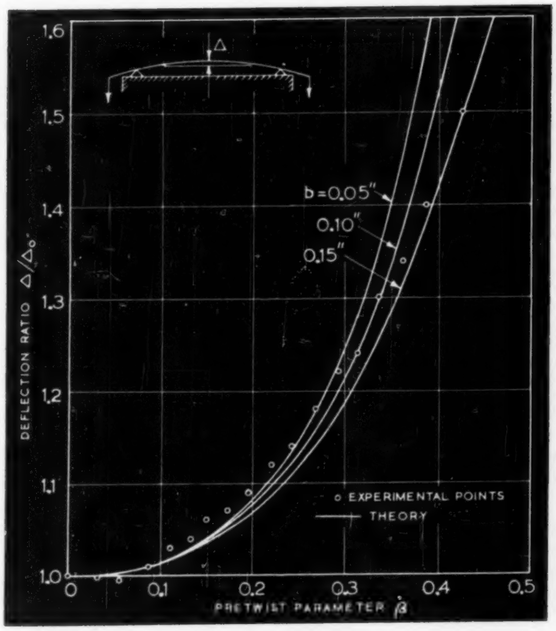
Three Cartesian co-ordinate systems used in a study of displacement continuity in the elastic half space. Areas *A* and *A'* over which there is a discontinuity in the displacement. *A'* is the image of *A* reflected in the $z = 0$ plane.

The co-ordinate system used in Rongved's paper is oriented such that the displacement discontinuity is over an area in the $z = 0$ plane. In Section 1, this solution is given in a new co-ordinate system oriented such that the dislocation has an arbitrary position with respect to the $z = 0$ plane. The Papkovitch functions for two such solutions are given; the first, for a dislocation in the region $z > 0$, and the second, for a dislocation in $z < 0$. The two dislocations are assumed to be identical except that one is located at the image of the other with respect to the $z = 0$ plane. It is to the first solution that we wish to add a state of stress such that the traction vanishes on the $z = 0$ plane. The Papkovitch functions for the second solution are used here since it turns out that the Papkovitch functions for the state of stress to be added can be expressed conveniently in terms of them. This is shown in Section 2. In Section 3 the displacement is determined in closed form for the case of a constant-displacement discontinuity over a rectangular area parallel to the boundary.

The Bending of Pretwisted Thin-Walled Beams of Symmetric Star-Shaped Cross Sections...57—A-84

By L. Maunder, University of Edinburgh, Edinburgh, Scotland. 1957 ASME Annual Meeting paper (in type; to be published in the *Journal of Applied Mechanics;* available to Oct. 1, 1958).

The customary method of determining the elastic bending deflections of pretwisted beams predicts that the deflections of a uniform beam with a cross section having equal principal moments of inertia will be independent of pretwist. Experimental deflections of a thin-walled pretwisted beam with a doubly symmetric cruciform cross section have been found, however, to be significantly larger than those thus predicted. Based on energy methods, an approximate analysis is developed for pretwisted thin-walled beams having symmetric star-shaped cross sections, which takes into account the effect of interactions between pretwist and distortions of cross sections. An equivalent bending stiffness is derived which is a function of pretwist.



Variation with pretwist of bending deflections of beam with cruciform cross section

The Nature of Axisymmetric Wave Fields in Elastic Solids...57—A-21

By H. A. Lang, Mem. ASME, The Rand Corporation, Santa Monica, Calif. 1957 ASME Annual Meeting paper (in type; to be published in the *Journal of Applied Mechanics;* available to Oct. 1, 1958).

Expressions for the displacements established in an infinite half-space by a concentrated unit impulse which is a step function of time are determined by extending to the axially symmetric case, the procedure of F. Sauter previously applied to the concentrated line shock in two dimensions. The solution is limited to a surface source. The appropriate equations are generated by a cylindrical harmonic set of waves—doubly infinite in frequency and separation constant. Transform methods are used to satisfy the free stress boundary conditions. A convergent integral in the complex plane of the separation constant is established to eliminate the Bessel functions. The final complex integrals for the displacements exhibit branch points which establish the fact that the displacements involve elliptic integrals of all three kinds. Because of these singularities, the solution for the displacements and stresses separate into three sets which reflect the individual contributions of the dilatational (*P*) wave, the distortion (*S*) wave, and the von Schmidt head wave. Integral expressions are derived for the displacements. It is shown that these can be evaluated in closed form. To confirm the method partially, displacements and stresses are derived for an acoustic elastic material (in which only the *P*-wave is present). The results are used to prove that a pulse in acoustic material travels without dilatation, rotation, or acceleration; as Stokes and Love have observed. Some evidence is presented for the conjecture that wave transmission may depend upon the fact that Poisson's ratio is above or below a critical value, $\gamma_{crit} = 0.32$. Expressions for the surface displacements in exact, closed form for this problem as well as the buried pulse have been given by Pekeris.

Coupled Vibrations of Thin-Walled Beams of Open Cross Section..........................57—A-26

By J. M. Gere, Stanford University, Stanford, Calif., and Y. K. Lin, Vertol Aircraft Corporation, Morton, Pa. 1957 ASME Annual Meeting paper (in type; to be published in the *Journal of Applied Mechanics;* available to Oct. 1, 1958).

Determination of coupled frequencies of free vibration for beams of nonsymmetric, open cross section is discussed in this paper. Beams with various end conditions, including simple supports, fixed ends, and a cantilever, are considered. Results of both exact and approximate analyses are presented. For practical use, a simple approximate formula for determining frequencies of vibration for beams with any end conditions is given. The accuracy of the approximate formula is shown by comparison with results obtained by the exact method. The exact calculations were made on an IBM 605 Card Programmed Calculator.

Buckling of a Thin Annular Plate Under Uniform Compression..........................57—A-11

By N. Yamaki, Tohoku University, Sendai, Japan. 1957 ASME Annual Meeting paper (in type; to be published in the *Journal of Applied Mechanics;* available to Oct. 1, 1958).

Elastic stability of a circular annular plate has been treated by several researchers under various loading conditions. For example, Dean investigated the case of shearing forces distributed along the edges, and Meissner and Way studied the cases where uniform compressive forces are applied along one of the edges. Further, Willers discussed the case where the plate is subjected to the bending moment caused by initial stresses. Some of these problems also have been extended to the plate with variable thickness.

This paper deals with the elastic stability of a circular annular plate under uniform compressive forces applied at its edges. By integrating the equilibrium equation of the buckled plate, the problem is solved in its most general form for twelve different combinations of the boundary conditions of the edges. For each case cited, the lowest critical loads are calculated with the ratio of its radii as the parameter. It is clarified that the assumption of symmetrical buckling, which has been made by several researchers, often leads to the overestimate for the stability of the plate. Discussions for the limiting cases of the circular plate and infinite strip also are included.

An Approximate Analysis of Timoshenko Beams Under Dynamic Loads..................57—A-17

By B. A. Boley and Chi-Chang Chao, Columbia University, New York, N. Y. 1957 ASME Annual Meeting paper (in type; to be published in the *Journal of Applied Mechanics;* available to Oct. 1, 1958).

Several exact solutions for the behavior of Timoshenko beams under dynamic loads have appeared recently in the literature; these solutions have been derived with the aid of integral-transform techniques leading to results in terms of definite integrals. The numerical evaluation of these integrals must be performed separately for any particular values of the space and time co-ordinates and is therefore very cumbersome. In an attempt to circumvent these drawbacks, an approximate theory was developed on the basis of a traveling-wave approach and of the principle of virtual work. The basic theory presented there is of general validity; its application to specific examples was, however, restricted to a very short portion of the beam near the point of impact and to very short times because of the introduction of additional simplifying assumptions.

An approximate method for the analysis of Timoshenko beams under impact is presented; it is based on a traveling-wave approach and on the principle of virtual work. Displacement functions are assumed in terms of several time-dependent parameters; the latter are found as the solution of a set of ordinary differential equations. Some of the characteristics of the propagation of disturbances are analyzed in the Appendix. Illustrative numerical results pertaining to semi-infinite and finite beams also are presented.

Hydraulics

Losses in Flow Normal to Plane Screens................57—F-19

By W. G. Cornell, Mem. ASME, General Electric Company, Evendale, Ohio. 1957 ASME Fall Meeting paper (in type; to be published in *Trans. ASME;* available to July 1, 1958).

The flow of fluids in screens is of practical interest in many engineering problems; for example, removal of foreign objects from jet-engine inlet flow, simulation of nonuniform inlet-flow distributions for jet engines, smoothing flow, and producing turbulence in wind tunnels, and so on. In such cases, one problem of interest is the prediction of the total-pressure loss caused by the screen in terms of screen geometry and upstream-flow conditions.

Experimental data are correlated for total-pressure losses in subsonic-compressible, real-fluid flow normal to plane round-wire screens of square mesh, including new data at very high screen Reynolds number. A theory is developed for subsonic-compressible flow normal to plane screens of sharp-edged elements of any geometry, yielding predicted total-pressure losses which compare reasonably well with experimental data. The effect of Reynolds number on loss is found to be small, except at very low Reynolds number.

Method for Prediction of Boundary-Layer Separation and Growth for Application to Turbine-Blade Design..................57—F-30

By B. A. Jones, United Aircraft Corporation, East Hartford, Conn. 1957 ASME Fall Meeting paper (multilithographed; available to July 1, 1958).

Pressure gradients associated with the flow in turbine-blade passages frequently cause relatively high rates of boundary-layer growth on the blade convex surface, a condition which may lead to separation of the boundary layer and high losses in the turbine. The design of turbines which are aerodynamically efficient under the loading conditions specified in aircraft gas-turbine applications requires a knowledge of the boundary-layer flow and the conditions under which flow separation from the blade convex surface will occur. If these boundary-layer characteristics and limiting conditions can be predicted for arbitrary blade shapes, separation can be avoided and high aerodynamic efficiency obtained in the turbine.

Because of the limited information regarding the behavior of turbine-blade boundary-layer flow, a test program was established at the Research Department of United Aircraft Corporation to provide the additional data required for the development of a boundary-layer prediction method suitable for turbine design applications. To avoid the complexities associated with three-dimensional turbine flow, the tests were conducted with simulated two-dimensional turbine-blade passages in which detailed boundary-layer measurements could be obtained under carefully controlled flow conditions. Efforts were directed toward a general correlation of the results compiled from these tests which would enable the design engineer to approximate the limiting pressure rise and boundary-layer growth by means of readily available turbine design information.

This Research Department project was undertaken under the sponsorship of the Technical and Research Group of the Pratt & Whitney Aircraft Division of United Aircraft Corporation.

A method for predicting the separation and growth of boundary layers in adverse pressure gradients has been developed for application to the design of turbine blading. The method employs the boundary-layer momentum equation as a framework for the correlation of test results obtained in a two-dimensional model turbine passage. The effects of shock-boundary layer interaction, transition, and surface curvature on boundary-layer development are discussed, and predictions of limiting energy recovery and momentum thickness are compared with isolated airfoil data, compressor cascade data, and two-dimensional and conical diffuser data.

Petroleum

Improving Performance of Packings and Gaskets..........57—PET-33

By R. H. Koch, E. I. du Pont de Nemours and Company, Inc., Wilmington, Del. 1957 ASME Petroleum Mechanical Engineering Conference paper (multilithographed; available to July 1, 1958).

Improving the performance of packings and gaskets has become increasingly important as maintenance costs have risen. Today's technology, with its emphasis on the continuous process and more severe operating conditions, demands materials and maintenance

ASME TRANSACTIONS

The December, 1957, issue of the Transactions of the ASME, which is the *Journal of Applied Mechanics* (available at $1 per copy to ASME members; $1.50 to nonmembers), contains the following papers:

The Timoshenko Medal

Effect of Lubricant Inertia in Journal-Bearing Lubrication, by J. F. Osterle, Y. T. Chou, and E. A. Saibel. (57—APM-37)

Method for Solving Problems of Irrotational Gas Flow, by Toyoki Koga. (57—APM-43)

Response of Nonlinearly Supported Boundaries to Shock Waves, by M. L. Baron. (57—APM-12)

Thermal Drift of Floated Gyroscopes, by L. E. Goodman and A. R. Robinson. (57—APM-31)

Stresses in Short Beams Under Central Impact, by A. A. Betser and M. M. Frocht. (57—APM-36)

The Forced Lateral Oscillations of Trailers, by A. Slibar and P. R. Paslay. (57—APM-4)

Superharmonic Oscillations as Solutions to Duffing's Equation, by C. P. Atkinson. (57—APM-45)

practices far more refined than those of the leather gasket and flax packing era.

This paper covers some of the more practical aspects of the maintenance problems with packings and gaskets, and the corrective actions that can be taken to minimize costs and unscheduled equipment shutdowns.

The over-all performance of either a packing or a gasket is dependent upon three basic interrelated factors. First, the material which must be selected in terms of the required operational characteristics. Second, the environment the packing must satisfy which includes among other things the process material, the flange surfaces, the over-all bolting arrangement, the shaft and stuffing box, and supplementary devices. Third, the physical application which comprises the human element involved in the installation and maintenance of these materials. Much can be said in detail about each of these factors, with respect to theory, design, types, and selection.

Rather than cover these detailed considerations in their entirety, actual experience will be related to indicate how these factors can more specifically and concretely influence the over-all maintenance job, and the approaches which can be followed to improve performance of packed and gasketed closures.

Multiple Parallel String Completions ....57—PET-37

By J. R. Feeser, Brown Oil Tools, Inc., Houston, Texas. 1957 Petroleum Mechanical Engineering Conference paper (multilithographed; available to July 1, 1958).

The recent well-completion technique for completing two or more zones in the same well bore by using multiple parallel strings of tubing and related equipment is the subject of this paper.

The present technique of running independent multiple strings of tubing has received widespread acceptance by the petroleum industry. This technique, which is referred to as PRIME (Parallel Retrievable Independent Multiple-string Equipment) Completion technique, is only three years old and has been employed to date in some phase in more than 2000 wells.

Multiple-string completions are practical because they: Save steel, reduce development costs, reduce workover costs, prolong casing life, increase reserves by making production of thin reservoirs commercial, permit production of zones with high surface pressures, utilize reservoir energy to the fullest, allow practical simultaneous artificial lift of multiple zones, permit safe and economical depletion of offshore wells, and permit permanent-type well completion of one or more zones.

Flexural Vibrations of Stiffened Plates, by W. H. Hoppmann, II, and L. S. Magness. (57—APM-38)

Buckling of Struts on Thin Plate, by J. L. Cutcliffe and H. S. Heaps. (57—APM-7)

Buckling of Rectangular Plates With Two Unsupported Edges, by P. Shuleshko. (57—APM-46)

Velocities of Long Waves in Plates, by D. C. Gazis and R. D. Mindlin. (57—APM-29)

Asymmetrical Bending and Buckling of Thin Conical Shells, by Paul Seide. (57—APM-42)

Cylindrical Shells Under Line Load, by R. M. Cooper. (57—APM-28)

Behavior of Cylinders With Initial Shell Deflection, by M. E. Lunchick and R. D. Short, Jr. (57—APM-35)

Stresses in a Strip With Two Pairs of Semicircular Notches, by A. Atsumi. (57—APM-41)

The Sector Problem, by Gabriel Horvay and K. L. Hanson. (57—APM-30)

Force in the Plane of Two Joined Semi-Infinite Plates, by J. T. Frasier and Leif Rongved. (57—F-7)

Stress-Strain Relations of a Granular Medium, by J. Duffy and R. D. Mindlin. (57—APM-39)

Elastic Coefficients of the Theory of Consolidation, by M. A. Biot and D. G. Willis. (57—APM-44)

Calendering of a Viscoelastic Material, by P. R. Paslay. (57—APM-1)

An Elongating String Under Action of Transverse Force, by Werner Goldsmith. (57—APM-9)

Design Data and Methods

Effect of Elastic Racks on Vibration Mounting of Equipment, by R. A. Di Taranto.

Brief Notes

Five-Line Construction for a Computing Linkage, by F. Freudenstein

Negative Group Velocities in Continuous Structures, by S. H. Crandall

Oblique Contact of Nonspherical Elastic Bodies, by H. Deresiewicz

Discussion

On previously published papers by S. J. Kline and F. O. Koenig; P. M. Naghdi; E. R. G. Eckert and T. F. Irvine, Jr.; W. A. Nash; E. Erdelyi and G. Horvay; P. G. Hodge, Jr., and Nicholas Perrone; Richard Skalak; J. Hirschhorn; H. G. Landau; Takeo Yokobori; R. L. Sharma; H. E. Weber and J. H. Keenan; J. Kestin and H. E. Wang; H. Laks, C. D. Wiseman, O. D. Sherby, and J. E. Dorn; J. L. Lubkin; and H. W. Woolard.

Book Reviews

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Tribute to C. E. Davies, retiring secretary,

ASME Honors Engineers

Biographies of Recipients of the Honorary Membership, the Awards, and Medals at the 1957 Annual Meeting

The ASME Annual Meeting Banquet, high light of the Society's calendar of outstanding events, serves as the brilliant stage for the bestowal of honorary membership, medals, and awards.

This year, in the presence of more than 1400 persons, the proceedings were further enhanced when tribute was paid to the Society's sixth secretary, C. E. Davies.

A description of the banquet and a list of the recipients of honorary membership, prizes, and awards will be found elsewhere in this issue. In the following pages brief biographies are presented so that members of the Society may know what manner of men they have honored.

Tribute to C. E. Davies

C. E. Davies, sixth secretary of The American Society of Mechanical Engineers, has demonstrated during his 23 years in the office, from which he is now retiring, the utmost in imaginative and vigorous leadership that has come to be expected in this position.

During his administration, ASME membership and activities have expanded to new highs. When Mr. Davies assumed the secretary's office, the Society had 14,227 members and 16 Professional Divisions. He leaves it with more than 45,000 members and 23 Professional Divisions.

Co-operation with other groups has also been fostered by Mr. Davies' efforts. He was an organizer and the first secretary of Engineers' Council for Professional Development. He also took the lead in organizing a group of presidents and secretaries of the Founder Societies which later developed into the Engineers Joint Council, and he is credited with being the American engineer who has done the most to promote mutual understanding and co-operation among the engineering societies of the Western World; particularly, between ASME and The Engineering Institute of Canada. In addition, he was the first nonresident of Great Britain to be president of The Newcomen Society of England. All this has taken place as an adjunct to Mr. Davies' work in enlarging and improving ASME and in aiding it to function smoothly as a whole.

The retiring secretary, Mr. Davies, came to his office with a thorough knowledge of Society activities. His first contact with the Society came in 1915 when he joined as a Junior Member after he had received an ME degree from Rensselaer Polytechnic Institute, which he now serves as a member of its board of trustees. He became a member of the ASME staff in 1920 as associate editor and his responsibilities soon included meetings and programs. He assisted Society planning committees devoted to aims, objectives, scope, and organization and took a leading part in the organization of the Professional Division. He also was the liaison agent between the secretary's office and numerous Society committees and joint activities. In 1931, he was appointed executive secretary and on the death of Secretary Calvin W. Rice, in 1934, was appointed to that position.

Mr. Davies also has served his country with distinction. From 1941 to 1945 he was a colonel and chief of the Control Branch, Office of the Chief of Ordnance of the U. S. Army. As a result of his work he received the Legion of Merit.

Starting on Jan. 1, 1958, Mr. Davies will devote full time to his new position, that of Building Co-ordinator for the new United Engineering Center, where he will employ for joint benefit the same talents that have helped ASME maintain its eminence and leadership among professional engineering societies.

Honorary Membership

Honorary membership in ASME, which was the Society's initial form of award, has throughout the years remained the Society's highest honor. It is conferred upon distinguished persons in engineering, science, industry, research, public service, and allied pursuits.

Basis for awarding honorary membership is "effective and faithful service rendered to the Society, to the engineering profession, or to the public." The character and scope of the service rendered are the predominant criteria rather than strictly engineering or scientific attainments. Hence the honor is distributed widely in all walks of life enhanced by the skill, leadership, and experience of engineers and those with whom they work and associate.

The first honorary member, Horatio Allen, was elected in 1880, the year of the Society's founding. Three of the founders of the Society—Alexander Lyma Holley, John Edson Sweet, and Henry R. Worthington—were elected honorary members in perpetuity.

Honorary membership in ASME gains added prestige because engineers throughout the world are eligible. Of the 180 honorary members chosen previously, over one third have been citizens of foreign countries. These include: Belgium, Canada, China, Denmark, France, Germany, Great Britain, Italy, Japan, Sweden, Switzerland, and Uruguay.

Normally, up to five honorary members may be named each year. Nominations are made through the ASME Board on Honors, and elections are approved by unanimous vote of the Council. This year the Council approved just one candidate.

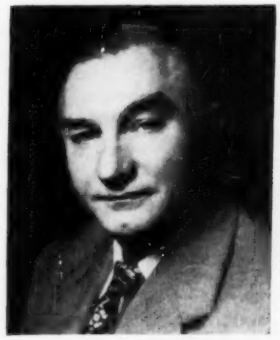
Ervin George Bailey

During a long and outstanding career, E. G. Bailey, past-president of ASME and founder of the Bailey Meter Company, has devoted most of his professional time to improvements in steam and combustion engineering. He developed a boiler meter to indicate and record information. In the fields of pulverized-coal firing and furnace design he developed practical applications of the slag-tap furnace, the two-stage furnace, the

Davies

Bailey

Boelter



open-pass boiler, intertube burners, pulverizers, a form of water-cooled furnace-wall construction, and the direct firing of pulverized coal in high-capacity boilers. All of these designs are still in common use. He has also made contributions to scientific coal sampling and to research in the behavior of coal ash.

Mr. Bailey's interest in these problems started during his college career at the Ohio State University, from which he was graduated in 1903 with an ME degree. He continued working on the problems as assistant and, later, chief of the testing department of the Consolidation Coal Company of West Virginia.

While he was a partner in the Fuel Testing Company of Boston, from 1909 to 1915, he developed his famous meter. In 1916 he organized the Bailey Meter Company to manufacture and to sell it and other of his subsequent innovations.

In 1926 the Bailey Meter Company was acquired by The Babcock & Wilcox Company, and Mr. Bailey remained as its president until 1944 and as chairman of the board for many years thereafter; he also became president of Fuller Lehigh and in 1930 vice-president of Babcock & Wilcox. In 1952 he retired from this position, remaining as a director of the company until 1956.

Although busy as an inventor and executive, Mr. Bailey has found time to write upwards of 30 papers on boiler and power-plant instruments, fuel conservation, control equipment, and the development of young engineers, a subject in which he has always been interested. While he was president of ASME in 1948, he made it a point to seek contact with the younger members of the Society.

He has always been active in Society affairs. Besides holding the presidency, he has been on numerous committees as member and chairman. He has also served on the Engineers Joint Council and was organizing chairman of the Engineering Manpower Commission.

Mr. Bailey has earned an impressive number of awards. Among them are: The John Fritz Medal, the ASME Medal, the Longstreth Medal, the Lammé Medal, the Percy Nicholls Award, the Distinguished Service Award from Ohio State University; doctorates from Lehigh University, Ohio State University, and Lafayette College. He is a member of Sigma Xi, Tau Beta Pi, Pi Tau Sigma, The Newcomen Society, and many others. He is an Honorary Member of The Institution of Mechanical Engineers (Great Britain) and ASCE.

Medals and Awards

ASME Medal

The ASME Medal, established in 1920, is awarded for distinguished service in engineering and science. The Society established this award so that it might give recognition not only to outstanding engineering achievement, but also to achievement in science which is capable of application in engineering fields. Through the years the world's engineers and scientists have come to regard the ASME Medal as a reward of merit which ranks among the highest in the scientific field.

Perhaps this is because of the broad interpretation of engineering and science which has been used by the Society in bestowing this medal. To qualify for the ASME Medal, a person does not have to be a member of ASME or even an engineer. He may be a scientist, industrialist, public official, or anyone who has rendered distinguished service in engineering and science. The award has been made in areas of:

1 Scientific, experimental, and industrial research and development, and the organization and administration of such activities.

2 The application of the results of research to the design and/or operation of equipment, plants, organizations, methods, and processes.

3 Technical and industrial leadership in the organization and administration of research, engineering, and industrial operations.

The roll of ASME Medalists contains the names of eminent engineers and scientists who have rendered distinguished service in their chosen fields of endeavor, such as management, manufacturing, physics, power generation, engineering design, machine tools, lubrication, air conditioning, optics, and marine construction.

The first ASME Medal was awarded to Hjalmar G. Carlson in recognition of the services he rendered the government through his invention and production of drawn steel booster casings.

Llewellyn M. K. Boelter

During his years of teaching at the University of California, Llewellyn M. K. Boelter, dean of the College of Engineering at Los Angeles, has stimulated the development of a strong group of outstanding students and is credited with influencing the education of many others outside his own college, both through his contributions to engineering literature and to curriculum planning.

Dean Boelter led in the preparation of the widely used textbook "Heat Transfer Notes," and has written many original articles on heat transfer, thermodynamics, and fluid mechanics.

As dean of the Engineering School, he has instituted and supervised many projects at California, including basic and applied research in human heat tolerance, thermal biotechnology, aircraft heat transfer, traffic engineering, and atmospheric turbulence.

In 1949, Dean Boelter's idea for a unified undergraduate engineering curriculum leading to a BS degree was put into effect. The success of this plan has given it increasing support and recognition by other engineering schools, by technical and scholarly societies, and by industry.

Draper

Iddles

Timoshenko

Prager

Dean Boelter was also instrumental in developing a graduate-level program for engineers in industry which enables them to continue graduate work, while employed, through evening courses offered at a number of locations.

A Minnesotan by birth, Dean Boelter has spent virtually all of his professional life at one or the other of the University of California's divisions. He was graduated from the Berkeley campus with a BS degree in mechanical engineering in 1917 and received an MS degree in electrical engineering the next year, staying on at Berkeley as teacher and researcher. In 1943, he was appointed associate dean of the College of Engineering there, and a year later was selected as dean of the Engineering School at the Los Angeles campus.

A registered engineer in California, he is a member of Tau Beta Pi, Sigma Xi, Pi Tau Sigma, honor societies, and a Fellow ASME.

The Holley Medal

The Holley Medal is bestowed only for some great and unique act of engineering genius that has accomplished an outstanding and timely public benefit. It is not awarded annually, but only when thoroughly warranted.

The general rules in the deed of gift specify that "attention shall be concentrated on the brilliance and benefit of his act—not on the man.

"The achievement should be of such public importance as to be worthy of the gratitude of the nation and call forth the admiration of engineers. It should therefore be reserved for those meriting the highest honor within the gift of the mechanical-engineering profession."

The medal, endowed in 1924 by George I. Rockwood, a past vice-president of the Society, was named, at Mr. Rockwood's request, for Alexander Lyman Holley, one of the founders of ASME and the man responsible for bringing the Bessemer process of steelmaking to this country.

The first recipient of the award was Hjalmar G. Carlson, whose invention aided in the production of artillery ammunition.

Charles Stark Draper

The contributions of Charles Stark Draper to the development of antiaircraft gun control are credited with permitting Allied ships to penetrate waters patrolled by enemy planes, thus aiding the successful prosecution of World War II. With the support of the U. S. Navy and the Sperry Rand Corporation, Professor Draper developed ideas he had formulated on computing gunsights before the war. The result was the Mark 14 gunsight which, many believe, literally stopped the kamikaze warfare in the Pacific. Later, the same principles applied to fire-control equipment in aircraft permitted United Nations forces to assume air mastery in Korea.

Over the past 15 years Professor Draper has concentrated mainly on this problem of antiaircraft and air-borne fire control, largely in connection with work he has done for the Navy and for the Air Force. He has, however, also worked in the fields of aeronautical power plants, flight testing, vibration measurements, aeronautical instruments and control engineering. He holds many patents for measuring and control equipment and has written extensively on instrumentation and control. Much of his writing is classified for security reasons.

Missouri-born Professor Draper's official titles are: Head of the Aeronautical Engineering Department, and director of the Instrumentation Laboratory at the Massachusetts Institute of Technology. He has been associated with M.I.T. since his student days when, after taking a BA degree in psychology at Stanford University, he entered M.I.T. and earned, successively, a BS degree in electrochemical engineering in 1926, an MS degree in 1928, and a DS degree in physics ten years later.

He has received many honors, including the Medal for Merit, highest civilian decoration; the U. S. Navy's Naval Ordnance Development Award and Distinguished Public Service Award; the Air Force department's highest civilian award, the Exceptional Civilian Service Award; and the New England Award of the Engineering Societies of New England. He is a Fellow ASME.

ASME George Westinghouse Gold Medal

The ASME George Westinghouse Gold Medal, which was first presented at the Society's 1953 annual meeting, is bestowed annually, if warranted, for "eminent achievement or distinguished service in the power field of mechanical engineering."

It was instituted at the 1952 annual meeting at the suggestion of the Westinghouse Educational Foundation that such an award be established "to perpetuate the value of the rich contributions to power development made by George Westinghouse, honorary member and twenty-ninth president of the Society." At an early stage in the development of

electric power, Westinghouse realized the potential value of utilizing alternating instead of direct current and was instrumental in developing the necessary apparatus, including the transformer, the induction motor, and the steam turbine.

Based upon a broad interpretation of the term "power," the award recognizes contributions of utilization, application, design development, research, and the organization and administration of such activities in the power field. Candidates are not restricted by age or profession, nor is membership in any engineering society or organization a factor.

The first recipient was Alexander G. Christie, emeritus professor of mechanical engineering at The Johns Hopkins University.

The Westinghouse Educational Foundation, which furnished a gift for endowment of the award in 1953, engages in a wide program for the promotion of science and education.

Alfred Iddles

Alfred Iddles, director and past-president of The Babcock & Wilcox Company, has spent a long, distinguished career in many phases of engineering, a major part of it as an executive concerned with power-plant design and construction.

Born in Michigan, Mr. Iddles attended the State College, from which he received a BS degree in 1912 and a professional degree in mechanical engineering in 1917.

In 1914, after working as a superintendant of the Michigan Light Company, he assumed a teaching post in mechanical engineering at Michigan State College, leaving his assistant professorship in 1918 to enter the army. He served during the war as a captain in the chemical warfare service.

After army duty, Mr. Iddles worked briefly as a fuel engineer for the Bureau of Mines and then went to the Day and Zimmerman Engineering and Construction Company as chief power engineer in charge of design for all of the company's power work. With them he moved into the post of chief engineer and then vice-president of the company, and later assumed vice-presidential posts in United Engineers and Constructors and Dwight P. Robinson and Company.

In 1937, Mr. Iddles joined The Babcock & Wilcox Company as special assistant to the vice-president in charge of engineering. In 1945, he became vice-president of the company and, in 1948, president, a post he held until his retirement from the company in 1957. He is now president of the Atomic Industrial Forum. Mr. Iddles, author of many papers on power utilities and coauthor of the textbook, "Steam Engine Design," has received honorary DE degrees from Michigan State College, the Polytechnic Institute of Brooklyn, and New York University.

A former Vice-President and Fellow ASME, and a member of many of its committees, he also belongs to The Franklin Institute, Newcomen Society, Society of Naval Architects and Marine Engineers, American Iron and Steel Institute, and the American Nuclear Society.

The Timoshenko Medal

The Timoshenko Medal, newest addition to ASME awards, is to be given annually in "recognition of distinguished contributions to applied mechanics without restriction as to nationality or profession."

It was instituted through the Applied Mechanics Division of the Society to honor Stephen P. Timoshenko and to commemorate his contributions to applied mechanics as author and teacher.

Professor Timoshenko, world-famed authority in the field and one of the organizers of the ASME Applied Mechanics Division, will be the first recipient of the award with which he is being honored. He will receive a bronze medal and a certificate.

Stephen P. Timoshenko

Stephen P. Timoshenko, world authority in applied mechanics, Hon. Mem. ASME, winner of the Worcester Reed Warner Medal, and a chief participant in the founding of the Applied Mechanics Division, was born near Kiev, Russia, in 1878.

Educated at St. Peterburg's Institute of Ways of Communication, he became an instructor there after graduation, and later taught at the Polytechnic Institutes of Kiev and of Zagreb, Yugoslavia. In 1907 he received the degree of "Adjunct of Applied Mechanics" for his thesis on the lateral buckling of girders, and in 1911 was awarded the Jourawski Medal for his work in the theory of elasticity, particularly for his paper, "On Stability of Elastic Systems."

In 1922, Professor Timoshenko left Zagreb to come to the United States as a consulting engineer for the Vibration Specialty Company. The next year he joined the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.

However, even while working in industry, he continued to lecture at various colleges and, finally, his love for teaching took him, in 1927, to the University of Michigan as professor of engineering mechanics. In this capacity he was able to resume the writing of books and papers embodying his original research, continuing a pattern he had set in Russia. He is the author of fifteen books in English, French, German, and Russian, and scores of papers.

The year 1927 also saw the founding of the Applied Mechanics Division, in which Professor Timoshenko played such an important part. He also spent considerable effort to make possible the publication of the *Journal of Applied Mechanics*.

In 1936, Professor Timoshenko accepted the chair of theoretical and applied mechanics at Stanford University, beginning an association he still continues.

Although he considers himself primarily a teacher, Professor Timoshenko has always maintained connection with industry by continuing to act as a consultant for a number of firms.

He has won many awards for his work. Besides those mentioned above, he has received honorary DE degrees from Lehigh University and from the University of Michigan, the James Watt International Medal and the Lammé Medal. Many societies, both national and international, name him as a member. A long-time member of ASME, he was elected an Hon. Mem. in 1952.

Worcester Reed Warner Medal

The Worcester Reed Warner (Gold) Medal was established in 1930 by bequest of Worcester Reed Warner, charter member and sixteenth president of the Society. It is awarded for an outstanding contribution to the permanent literature of engineering. In order to qualify for consideration, such literature must be not less than five years old and shall be recognized as a noteworthy contribution to the profession.

Topics must deal with items such as engineering, scientific and industrial research associated with mechanical engineering, design and operation of mechanical and associated equipment, industrial engineering or management, or closely related subjects.

The Worcester Reed Warner Medal was first conferred in 1933 when the recipient was Dexter S. Kimball, author of "Principles of Industrial Organization."

William Prager

William Prager, through his books and papers, has contributed greatly to

Chao

Trigger

Hegetschweiler

Bartlett

Logeman

Smiddy

the theory of plasticity and to its practical applications. He is senior author of the book "Theory of Perfectly Plastic Solids," which is credited with making possible application of complicated mathematical theory to practical engineering problems. In addition, he has given many original ideas to technical literature through his numerous papers in both German and English. Among these papers are: "On Isotropic Materials With Continuous Transition from Elastic to Plastic State," "Strain-Hardening Under Combined Stresses," "Variational Principles in the Theory of Plasticity," and "Discontinuous Solutions in the Theory of Plasticity."

Born in Karlsruhe, Germany, Professor Prager was graduated in 1925 from the Institute of Technology in Darmstadt, from which he later received the DE degree.

In 1927, he began his career in teaching and held posts at Darmstadt, Goettingen, and Karlsruhe, before going to Turkey to lecture at the University of Istanbul in 1933. After an eight-year tenure there, he came to the United States, to Brown University, where he is now professor of applied mechanics.

During the years that he has been at Brown, he has also accepted requests to lecture at other schools. In 1955 he presented the James Clayton Lecture before The Institution of Mechanical Engineers in London, and lectured at the Swiss Federal Institute of Technology in Zurich; the Sorbonne in Paris; the Technical University of Delft, Holland; the Imperial College of Science and Technology in London, and the University of London.

Besides teaching, Professor Prager has been active as consultant to many firms. He is managing editor of the *Quarterly of Applied Mathematics*, a post he has held since the year of his arrival in this country.

Professor Prager joined ASME in 1943. He is also a Fellow of The American Society of Arts and Sciences.

Blackall Machine Tool and Gage Award

The Blackall Machine Tool and Gage Award is named for Frederick S. Blackall, jr., president and treasurer of The Taft-Peirce Manufacturing Company, who served successively as president of The National Machine Tool Builders' Association in 1952, and as president of The American Society of Mechanical Engineers in 1953. It is awarded annually to the author or authors of such paper or papers deemed the best of those submitted to the Society on a subject clearly concerned with or related to the design or application of machine tools, gages, or dimensional measuring instruments. There is no limitation as to age, nationality, or society membership.

The first award of the Blackall Machine Tool and Gage Award was made in 1955 at the ASME Diamond Jubilee Annual Meeting in Chicago, Ill., to Carl J. Oxford, Jr., and John A. Cook.

Bei Tse Chao and Kenneth J. Trigger

Bei Tse Chao was graduated in 1939 from National Chiao-Tung University, Shanghai, with the BS degree in engineering. Traveling to England for his doctoral degree, he earned it in 1947 at the Victoria University of Manchester.

After four and a half years of industrial experience in small tools and gage manufacturing, he joined the staff of the mechanical-engineering department of the University of Illinois in 1948 and is presently professor of mechanical engineering there.

He has authored, both alone and jointly, more than a dozen papers and articles on metal cutting and related subjects. Professor Chao's major interests are in metal cutting, applied mechanics, and heat transfer.

He is a member of Sigma Xi, an honorary member of Pi Tau Sigma, and is on the reviewing staff of the *Applied Mechanics Reviews*.

Kenneth J. Trigger is professor of mechanical engineering in charge of the industrial-production division of the University of Illinois.

His major field of interest has always been metallurgy and metal cutting, and he is author or coauthor of numerous papers and articles on fundamentals of metal cutting.

Professor Trigger, who holds BSME, ME, and MS degrees from Michigan State College, has been at the University of Illinois since 1938. There he has conducted experiments involving design of equipment for nitriding of high-speed steel, hot quenching of molybdenum-tungsten high-speed steel, and machinability and physical properties of sulfur vs. sulfite steel. From 1940 to 1942 he conducted defense training courses in heat treatment and welding metallurgy.

Before he went to Illinois, Professor Trigger was on the staff at Michigan State College, Swarthmore College, and Lehigh University.

He is a member of Sigma Xi, Tau Beta Pi, Pi Tau Sigma, and ASME, among others.

Prime Movers Committee Award

THIS Annual Award, established in 1954 from a fund donated by the Prime Movers Committee of the Edison Electric Institute, is conferred in recognition of outstanding contributions to the literature of thermal electric station practice or equipment.

Heinrich Hegetschweiler and R. L. Bartlett

HEINRICH HEGETSCHWEILER and ROBERT L. BARTLETT for their paper, "Predicting Performance of Large Steam Turbine-Generator Units for Central Stations."

Heinrich Hegetschweiler was born in Zurich, Switzerland, in 1921. He was graduated from the Federal Institute of Technology in Zurich with a diploma in mechanical engineering in 1945.

After two years with Escher Wyss in his native city, where he completed various assignments in their steam-turbine division, Mr. Hegetschweiler came to the United States in 1948.

After a short assignment in the General Electric Company's test program, he was employed as a design engineer in turbine engineering for General Electric in Schenectady. He has since attained the post of supervisor of turbine steam design engineering in the large steam turbine-generator department of General Electric.

Mr. Hegetschweiler is a Mem. ASME.

Robert L. Bartlett, born in Newport News, Virginia, in 1925, received his secondary education locally and attended the Virginia Polytechnic Institute in 1942–1943.

He joined the U. S. Navy V-12 program in 1943 and was sent to Rensselaer Polytechnic Institute, from which he received a BME degree in 1945, and then served as an officer in the Pacific area.

On his return, Mr. Bartlett went to work in marine-engineering design for the Newport News Shipbuilding and Drydock Company and remained there until 1948. In 1949 he traveled to Istanbul, Turkey, to teach heat-power engineering at Robert College Engineering School.

When he came back to the United States in 1952, Mr. Bartlett joined the large steam turbine-generator department of the General Electric Company and is currently engaged there in steam turbine application.

This year he has also received the degree of MME from Rensselaer Polytechnic Institute. He is a Mem. ASME.

Arthur L. Williston Award

Walter F. Logeman

THE Williston Award, established in 1954 by Arthur L. Williston, Mem. ASME, is given for the best thesis by an undergraduate student or a junior engineer on a prescribed topic of changes in, or additions to, engineering college curriculums designed to encourage civic responsibility and interest in constructive social or public activities.

Walter F. Logeman has won the Williston Award for his paper, "Fostering a Spirit of Civic Service in an Engineering Curriculum."

Born in Newark, N. J., in 1929, he attended schools in Irvington and Union. After graduation from Union High School in 1947, he founded his own milk business, which he built into a thriving concern and then sold six years later to enter the College of Engineering at Rutgers University. For his last three semesters at Rutgers, Mr. Logeman held the University Trustees Scholarship, and, as a senior, worked for the university's department of civil engineering.

In June of this year Mr. Logeman, who was a member of the ASME Student Branch, was graduated with a BS degree in mechanical engineering. He is now in training with the Linde Company as a junior engineer in production. His work involves a great deal of traveling, but when he is eventually stationed at one particular plant, he hopes to start graduate work.

Mr. Logeman's hobbies, when he finds time for them, are sports and photography. He is an Assoc. Mem. ASME.

The Henry Laurence Gantt Gold Medal

THE Henry Laurence Gantt Gold Medal was established in 1929, to be awarded for "distinguished achievement in industrial management as a service to the community."

The medal was established to memorialize the distinguished achievements and great service to the community rendered by Henry Gantt, management engineer, known as an industrial leader and humanitarian. The award is administered by a board comprised of representatives of The American Society of Mechanical Engineers and the American Management Association.

The medal was designed by Julio Kilyeni, who has achieved distinction as a designer of distinguished medals, including that of the fiftieth anniversary of The American Society of Mechanical Engineers.

First recipient of the award was Mr. Gantt himself, to whom it was awarded posthumously.

Harold F. Smiddy

Harold F. Smiddy considers scientific management both his vocation and avocation. A vice-president of the General Electric Company and a director of its international branch and its credit corporation, he is a member of ten professional organizations and is actively concerned in the management sections of most of them.

Mr. Smiddy headed the American delegation to the ninth International Management Congress in Brussels in 1951 and was designated the United States representative to the International Committee for Scientific Management by the American body, the Council for International Progress in Management.

He has served on various committees of the Management Division of ASME, of which he is a Member, and, in this capacity, is credited with contributing a great deal to the strengthening of the National Management Council. He has also been a member of the General Management Committee of the Society.

A director of the American Management Association, Mr. Smiddy also helped to reorganize the Management Research and Development Division of the Society for the Advancement of Management. In addition, Mr. Smiddy has made many speeches and written numerous articles on management research and development.

Mr. Smiddy started his business career in 1920, after receiving a BS degree in electrical engineering from the Massachusetts Institute of Technology, as a cadet engineer with the Public Service Electric Company. He then went to the West Penn Power Company of Pittsburgh as a service engineer, and, by 1930, had attained the post of operation manager. In that year he joined the Electric Bond and Share Company as head of the communications department. In 1935, he became head of the sales department for the management consultation branch of the same company, advancing to head of the operation section and director of the company.

In 1943, Mr. Smiddy became a consulting engineer for Booz, Allen, and Hamilton of New York, and, later, a general partner in the concern. He joined his present firm, General Electric, in 1948.

In recognition of his professional attainments, Mr. Smiddy was made an

Edmister

Hunter

McDonald

Olsen

Bowerman

Reynolds

honorary member of the New York chapter of Alpha Pi Mu, industrial-engineering honor society, and received the Taylor Key from the Society for the Advancement of Management.

Richards Memorial Award

The Richards Memorial Award, established in 1944, was named in honor of Charles Russ Richards, founder of Pi Tau Sigma, honorary mechanical-engineering fraternity.

It is given annually for outstanding achievement to a mechanical engineer who has been graduated for not more than 25, nor less than 20 years, from the regular mechanical-engineering curriculum of a recognized college or university. His achievement may be all or in part in any field, including industrial, educational, political, research, civic, or artistic.

Nominations may be made by any member or group of members of Pi Tau Sigma, any Section of ASME, the head of the mechanical-engineering department of any American college or university offering the regular four-year course or its equivalent in mechanical engineering, and other qualified individuals. From the nominations submitted, Pi Tau Sigma recommends to the ASME Board on Honors ten candidates for this award. The Board then selects the recipient and, with Council approval, the award is usually conferred at the ASME Annual Meeting.

The Richards Memorial Award was first conferred on Jacob P. den Hartog in 1947.

Wayne C. Edmister

A native of Cleveland, Okla., Wayne C Edmister earned his ME degree in 1932 from the Oklahoma A&M College, now Oklahoma State University. Two years later he received an MME diploma from Cornell University where he was a Telluride Association fellow.

After working as a research engineer in the field for Sinclair Prairie Oil and Gas Company, Mr. Edmister joined the Standard Oil Company of Indiana as a research and design chemical engineer. He remained there until 1943 when he became a technical assistant for the Rubber Reserve program of the Reconstruction Finance Corporation. In 1944, he went to the Foster-Wheeler Corporation in New York, N. Y., as a senior process engineer on petroleum-refinery projects, and, in 1947, joined Hydrocarbon Research, Inc., where he was assistant director of process development, concentrating on nuclear reactor design and the gasification of coal.

The next year, Mr. Edmister became a member of the faculty of the Carnegie Institute of Technology, where he taught chemical engineering. Teaching was no novelty in his diversified career, since he had previously been an instructor or guest lecturer for the Illinois Institute of Technology from 1938 to 1942 and at New York University in 1947-1948. When he left Carnegie Tech in 1952 to join the staff of California Research Corporation at Richmond, Calif., as an engineering associate in charge of technical data compilation and the development of unit operations and design methods, he continued his lectureships at the University of California, where he is still teaching. In addition, he has acted as consultant for many firms.

Mr. Edmister has written a great number of technical papers, concentrating on the fields of thermodynamic properties of fluids, multicomponent fractionation, hydrocarbon and petroleum processing, coal gasification, and chemical-plant-process design.

Mr. Edminster is a member of the American Institute of Chemical Engineers, the American Chemical Society, Pi Tau Sigma, Phi Kappa Phi, Sigma Tau, Sigma Xi, and ASME. In 1942 Oklahoma A&M College awarded him a professional degree in chemical engineering.

Pi Tau Sigma Gold Medal Award

The Pi Tau Sigma Gold Medal Award was established in 1938 through an endowment by Pi Tau Sigma, national honorary mechanical-engineering fraternity. It is awarded annually to a young mechanical engineer for outstanding achievement in mechanical engineering within ten years after graduation from a regular four-year mechanical-engineering course in a recognized American college or university. His achievement may be in any field, including industrial, educational, political, research, civic, or artistic.

Any man of good character who on July 1 each year has been graduated not more than ten years from the regular mechanical-engineering course of a recognized American college or university, shall be eligible for recognition.

Nominations may be made by any member or group of members of Pi Tau Sigma, any Section of ASME, the head of the mechanical-engineering department of any American college or university offering the regular four-year course

or its equivalent in mechanical engineering, and other qualified individuals. From the nominations submitted, Pi Tau Sigma recommends to the ASME Board on Honors ten candidates for this award. The Board then selects the recipient and, with Council approval, the award is presented usually at the ASME Annual Meeting.

The Pi Tau Sigma Gold Medal Award was first conferred, in 1938, on Wilfred E. Johnson.

Patrick Hill McDonald, Jr.

Patrick Hill McDonald, Jr., has won much comment, both for his teaching work and for his research in the field of applied mechanics. Chairman of the engineering research lecture series at North Carolina State College, he also developed and is teaching a graduate-level course in machine design and was active in helping to establish the Engineering School Honor's program.

Through his research work, Dr. McDonald is credited with developing much basic formulation of factors in the field of stress and vibration analysis. He has written a number of papers in this field, among them: "Nonlinear Dynamic Coupling in a Beam Vibration," "The Free Vibration of a Mass Supported on a Single Disc Spring," and "Analysis of Contact Stresses Under Combined Pressure and Twist." He has served as technical director of "Impact and Shock Resistance of Plastics," research sponsored by the Bureau of Ships, and of the Chisholm, Boyd and White Company's project, "Vibration Compaction of Granular Media." Much of his original work forms the basis of the graduate course he teaches.

Professor McDonald began his teaching career at North Carolina State College immediately after graduating from there in 1947. His college progress had been interrupted by two years served as an infantryman in Italy during World War II.

In 1948 he joined the faculty of Clemson College and taught mechanics and hydraulics there until 1950, when he entered Northwestern University as a graduate student. He received his MS degree in mechanical engineering in 1951, and, as a Royall E. Cabell Fellow, completed requirements for a PhD degree in 1953. In the latter year he returned to North Carolina State College as Research Associate Professor of Mechanical Engineering. He has been there since, and now holds the post of Research Professor of Mechanical Engineering.

An Assoc. Mem. ASME, Dr. McDonald has also been elected to Pi Tau Sigma, Sigma Xi, Tau Beta Pi, and Phi Kappa Phi, as well as the North Carolina Society of Engineers, Raleigh Engineers Club, and the Society for Experimental Stress Analysis.

The Alfred Noble Prize

The Alfred Noble Prize was established in 1929, through a fund contributed by engineers and others, to perpetuate the name and achievements of Alfred Noble, past-president of the American Society of Civil Engineers and of the Western Society of Engineers.

Participating with these two societies in the award are the American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, and the American Institute of Electrical Engineers.

The prize, which is a cash award, may be presented annually for a technical paper of exceptional merit accepted for publication by any of the five societies.

Ray D. Bowerman

Born in San Bernardino, Calif., in 1930, Ray D. Bowerman entered the California Institute of Technology in 1947, receiving his BS degree in 1951 and an MS degree in mechanical engineering in 1952. A Murray Scholar in that year and the next, he earned the professional degree of Mechanical Engineer from the Institute in 1955.

From 1951 to 1956, Mr. Bowerman was quite active in theoretical and experimental research on hydraulic machinery at the Institute. Based on this research, he produced four papers on pump performance and design: "Pressure Distributions on the Blade of an Axial-Flow Propeller Pump," "Effect of the Volute on Performance of a Centrifugal Pump Impeller," and "An Experimental Study of Centrifugal Pump Impellers," all jointly authored, and "The Design of Axial Flow Pumps."

In 1956, Mr. Bowerman entered industrial practice with the U. S. Industries Research and Development Corporation and the Axelson Division of the same company. The next year he joined the Task Corporation of Anaheim, Calif., where he is now engaged in engineering development in the fields of aerophysics research and aircraft electromechanical devices.

Mr. Bowerman is an Assoc. Mem. ASME and a member of Sigmi Xi.

Charles T. Main Award

The Charles T. Main Award was established in 1919 from a fund created by Charles T. Main, past-president of the Society, to be awarded for the best paper by a student member concerning the influence of engineering on public life. Mr. Hunter's paper is titled: "A Critical Analysis of Student Sections of the National Engineering Societies."

Joseph H. Hunter was born in Sidney, Ohio, in 1934 and attended grade and high schools there.

In 1952 he entered the University of Detroit, from which he was graduated in 1957 with the BME degree. For three years during his tenure at the University he worked for the Chrysler Corporation on a co-operative basis.

On his graduation this year, Mr. Hunter accepted a position as structural engineer at the Columbus division of North American Aviation, Inc.

Undergraduate Student Award

The Undergraduate Student Award, established in 1914 from a fund created by Henry Hess, past vice-president of the Society, is presented for the best paper or thesis submitted by a Student Member. Mr. Olsen's thesis is: "A Visual Study of Two-Dimensional Flow Mechanics."

William A. Olsen, Jr., graduated from the University of Connecticut this year with the BS(ME) degree. While a student, he was initiated into Tau Beta Pi and Sigma Xi, and the service fraternity of Alpha Phi Omega.

Mr. Olsen, who was working as a dynamics engineer for the Sikorsky Aircraft Corporation, is now on a six-month tour of duty as a lieutenant in the United States Army Chemical Corps.

Old Guard Prize

The Old Guard Prize, established in 1956, is awarded to Mr. Reynolds for his paper, "Computer Control of Machine Tools" (see pp. 59-60 in this issue). Winners are selected through a series of regional competitions with a final decision being rendered by a panel of judges at the ASME Semi-Annual Meeting. The award is made possible by members of the Society who, through long membership or age, have reached a dues-exempt status, but who contribute funds for worth-while purposes such as this prize.

George Marvin Reynolds was born in Pittsburgh, Pa., in 1935, but received his high-school education in Michigan.

He entered the University of Illinois in September of 1952, and the next year transferred to Northwestern University's Technological Institute. He expects to

Honors *(continued)*

receive his BS degree in mechanical engineering this month. During his college career he participated in a co-operative work-study plan with the Kearney and Trecker Corporation of Milwaukee.

He has engaged in many extracurricular activities during his college career, including being feature and news editor of the *Northwestern Engineer*, a member of the University Wildcat Marching Band, the varsity fencing team, and a guide for the Technological Institute. A member of the Student Branch of ASME, he was its president during his pre-senior year.

Following his graduation from Northwestern, Mr. Reynolds hopes to continue his studies at the University of Chicago toward a master's degree in business administration.

These three awards were presented at the Members and Students Luncheon Wednesday, December 4.

ASME Lecturers, 1956-1957

The ASME Lectures were instituted to bring to Sections of the Society, on a biennial basis, outstanding speakers on subjects of broad general interest and value to members of the mechanical-engineering profession. During the several years that the Lectures have been established, leading engineers have been selected for this service. The selection is, in itself, an honor. The Lecturer donates his time and receives no honorarium.

The following is a list of the 1956-1957 ASME Lecturers and their topics:

Nevin L. Bean, Automatic Transmission Division, Ford Motor Company, Livonia, Mich.

Topic: Automation in Russia.

Prof. J. P. den Hartog, head, mechanical-engineering department, Massachusetts Institute of Technology, Cambridge 39, Mass.

Topic: Vibration.

J. K. Dillard, Westinghouse Electric Corporation, East Pittsburgh, Pa.

Topic: Nuclear Reactor for Power Generation.

Orville E. Homeister, Atomic Power Development Associates, Inc., Detroit, Mich.

Topic: Nuclear Power Development.

Dr. Philip W. Swain, consultant in technical writing and speaking, Riverside, Conn.

Topic: Imagination—the Key to Engineering Achievement.

Dr. T. O. Jones, acting head, Office of Scientific Information, National Science Foundation, Washington 25, D. C.

Topic: Development of Atomic Energy.

"New Knowledge to Create Tomorrow's

It will be recorded as the 78th Annual Meeting of The American Society of Mechanical Engineers. The time: Dec. 1-6, 1957. The theme: "New Knowledge to Create Tomorrow's World." The record will say that the ASME held its meeting at the Hotels Statler and Sheraton-McAlpin, in the heart of Manhattan, along with its affiliate, the American Rocket Society, which held its sessions in the Statler. The grand total of registration of engineers, their wives, and their guests: 7000.

On the surface, it looked like other Annual Meetings of the ASME. The same meeting of minds, the world's mechanical engineers assembling to bring one another up to date. The same social gathering of men whose work, interests, and hopes run in similar channels, men who speak the universal language of science and engineering. The same presentation of technical papers—or almost.

But with a difference. The engineers who gathered at the sign of the ASME and the ARS felt a new dedication. A reporter attending the technical sessions found the word "alert" springing to mind. Outside, man-made satellites were circling the earth, and the western world had not put them there. Here, attending the sessions, were the men whose work might put us back in the scientific lead.

The ASME program: 126 technical sessions, 338 papers presented. A week of concentrated study and interchange. At the end, mechanical engineering had consolidated its gains for the year, and clarified its future course.

For the American Rocket Society, this was the 12th Annual Meeting. Its exhibit—held at the New York Coliseum as a feature of the Exposition of Chemical Industries—presented rockets, rocket motors, and rocket components.

In this year of "agonizing reappraisal," engineering education drew the attention of conferees and press. Crowds flocked to ASME sessions which featured papers on engineering curriculums, the development of creativity in the engineering student, and the professional development of the young graduate. Speakers at the social functions declared their beliefs on educational and professional problems.

The Annual Meeting is also the time of executive decisions and appointments. This meeting was distinguished by the appointment of O. B. Schier, II, to the post of Secretary of the ASME, to succeed C. E. Davies, who, after 23 years, retires to serve as Building Co-ordinator for the new United Engineering Center. J. N. Landis, vice-president of Bechtel Corporation, becomes President of the ASME for 1958.

In the following pages, we report the high lights of the 1957 Annual Meeting.

Research and Standards

"Strengthening the ASME Programs on Research and Standards," was the topic of this year's traditional Sunday evening discussion. Louis F. Polk, president of the Sheffield Corporation and chairman, ASME Board on Codes and Standards, reviewed some recent standardization problems. ASME and its affiliates

1957 ASME ANNUAL MEETING

World," theme of ASME's 78th national conclave

prepare more standards than any other organization, and international co-operation is becoming increasingly important. The Northern ABC countries (America, Britain, and Canada) recently adopted revised "drawing" practices, so-called because they were in agreement on all points except the spelling of drafting.

Millions of dimensions are involved in internationally exchanged products which are particularly important for defense. Yet, as a single example, the variations in the length of the inch between countries, although only in millionths, cause difficulties in interchange. Grade A U. S. gage blocks, with tolerances of ±4 millionths, become grade B in Canada, with an accuracy of only ±8 millionths, because of the difference in inches.

ASA has adopted the Canadian inch, which is midway between U. S. and British inches, for conversion tables; and the U. S. Bureau of Standards has had a program of some years standing to reach 1/10 millionth of an inch, which will emphasize even more the desirability of ABC standardization.

Retiring ASME President W. F. Ryan, who presided at the discussion, pointed out that more than 4000 ASME Members of ASME-sponsored committees help to strengthen the work in standards.

E. M. Barber of the Texas Company, and chairman of the ASME Research Executive Committee, explained that the function of the Research Planning Committee organized by the Council in 1952 is to serve as liaison between research committees, technical committees, and other ASME activities. A 1956 review of the progress found that, although 612 members were serving on 19 research committees, research was falling short of Council objectives, application was faulty, and there was a lack of communication to the members.

In spite of these shortcomings, the ASME research program is an active one, with many significant achievements to its credit. The Committee on Fluid Meters was cited as a good example of the "solid mastery of the technology" which can result from "background" research. The heavy dependence of engineering on research makes an "obligation to put a little back in the bank" through engineering-sponsored research.

Recommendations from the Society membership, not the Research Executive Committee, initiate projects which, although financially assisted at first by the Engineering Foundation, must demonstrate their soundness by achieving outside sponsorship. Four meetings a year are held by the Research Planning Committee for the purpose of screening research proposals, and four or five new projects have resulted this year, one of the best.

Several discussers from the floor felt that the Research Executive Committee should not be a passive group but should be an agency to stimulate research.

Mr. Barber pointed out that it was impossible for a single committee to know the whole spectrum of mechanical engineering, and the initiative should come from "experts" in each field.

The discussion concluded with a reminder of Aesop's fable, in which a group of mice decided a warning bell should be put on their common enemy, the cat, but could not decide which one would do the task. The vital significance of research in the current international situation makes it imperative that the research program be alert to the requirements. ASME should be ready to assume the direction and supervision of research, best handled by group sponsorship through an association of interested business or industrial concerns.

Technical Program High Lights

This was the year of the balanced program. Possibly never before have the technical sessions been so uniformly well attended. No subject was stretched too thin. Wise planning assigned certain of the papers to joint sessions, so that two divisions—in a few cases, three divisions—joined to discuss subjects common to all of them. Altogether, there were 126 technical sessions, in which 338 papers were presented.

There were papers on education, on consulting engineering, and a Junior session dealing with the professional development of the young engineer. Several divisions held symposiums: One, on welded spiral cases, was held jointly with the ASCE; another was the second annual symposium of the Lubrication Design Committee. At a joint session of Lubrication and Oil and Gas Power, eight papers from England were presented by a reporter.

A welcome innovation appeared at one session. The chairman opened with a talk in which he gave the audience the historical background of the developments to be discussed, an orientation that brought the papers into proper focus. This took place at a joint meeting of Nuclear Engineering and Gas Turbine Power.

A list of all the technical papers—authors, titles, and ASME numbers—appears elsewhere in this issue. In addition, all papers which are not scheduled for publication in MECHANICAL ENGINEERING will be abstracted in the

TECHNICAL SESSIONS

Seen at technical sessions, *listed left to right:* **1** A friendly argument over a point in R. H. Miller's paper is discussed with Rudolph Birmann, *right;* both are Mem. ASME. **2** Authors and chairmen OGP-1; Prof. L. L. Otto, Mem. ASME, Michigan State, vice-chairman; R. H. Miller, Mem. ASME, and consulting engineer; Prof. A. W. Hussmann, Penn. State; W. K. Newcomb, Mem. ASME, and chief engineer, Ingersoll-Rand, chairman. **3** Louis F. Polk, Mem. ASME, president, Sheffield Corp. and chairman, ASME Board on Codes and Standards, spoke at the discussion on "Strengthening the ASME Programs on Research and Standards." **4** F. D. Gowans, Mem. ASME, General Electric Co. discussed an 8500-hp gas-turbine-electric locomotive. **5** Raymond Winn, Air Force director of transportation, chairman of a joint Aviation-Materials Handling-SAE session on operational support for turbine-powered and cargo aircraft.

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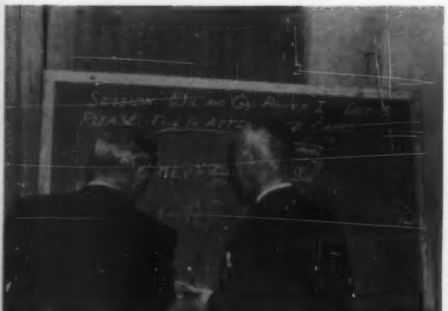

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"ASME Technical Digest," some in this issue, others in succeeding issues.

The ASME encompasses 23 divisions and 20 research committees, most of them represented by papers at the Annual Meeting. Here are some of the high points:

Applied Mechanics

The influence of the missile and aircraft programs appeared in the 45 papers presented at the Applied Mechanics Sessions. Gyroscopes (Effect of Finite Rotations on Gyroscopic Sensing Devices) and satellite vehicles (Torques on a Satellite Vehicle From Internal Moving Parts) came under discussion, along with the more conventional problems of beams, shafts, plates, and vibration damping.

Dr. D. C. Drucker of Brown University, technical co-editor of the *Journal of Applied Mechanics,* pointed out that a third of the papers fell into the category of dynamics and kinematics, a great increase over previous years. Another trend was toward the truly important and difficult questions of three-dimensional elasticity, and away from solutions with known techniques of special two-dimensional problems. Typical titles covered contact stresses under combined pressure and twist, effect of large curvature on the Hertz theory, and axisymmetric wave fields.

Plasticity studies, too, are moving into new areas, with work hardening being taken into account and elastic-plastic solutions sought, along with fundamental stress-strain studies. Seven papers demonstrated continued interest in plates and shells. A pleasing trend, in line with the new thinking, is the increasing number of experimental and combined theoretical-experimental papers in several areas of applied mechanics.

Among the problems attacked were: Vibration in beams, the vibration composed of both bending and torsion; bending of pretwisted thin-walled beams; instability of ring-stiffened cylindrical shells to external hydrostatic pressure.

Aviation

The ground conditions and operational support needed for both military and civil jet aircraft, particularly cargo carriers, were the topics of several Aviation Division sessions jointly sponsored in part by the Materials Handling and Safety Divisions and the Society of Automotive Engineers.

"None of the ground equipment is adequate for jet planes." Runways only 75 ft wide need stabilized areas to extend total width to 125 ft. Tractors with

12,000-lb drawbar loads are inadequate for 25,000-lb loads. A step up in electrical power available at the ramp, a better starting turbine, and a more efficient method of handling the greater volumes of new fuel are all needed. Second-level loading of passengers is desirable, and loading docks with adjustable loading ramps are being investigated.

The new Boeing 707 utilizes preloaded baggage containers, and other revised handling procedures are needed to reduce the amount of equipment in the vicinity of the plane—now more than can be parked in the space available. The goal is two trips a day for the 9-hr nonstop N. Y. to L. A. flights which are reducing the size of the country by 35 per cent.

On the 25th anniversary of the handling of air freight, "electronic requisitioning and fast delivery" are the new logistic philosophies of material handling to reduce stockage, procurement, obsolescence, and warehousing, particularly, the vulnerability of overseas warehouses. A \$10-million additional investment in transportation would save \$38 million in procurement costs, while at the same time reducing the J-57 engine inventory alone by \$337 million. Palletized unit loads will reduce man-hours for handling by $3^1/_2$ to 1, and permit mechanical handling of maximum-size unit loads. The Douglas C-133, for example, provides a rapid-loading system as an integral part of the aircraft with conveyer loading. Compatible procedures between civilian and military aircraft are a necessity.

Fuels

Stokers, by-product fuels, the BCR automatic coal-fired packaged steam generator, and fuel-accounting procedures were the topics of fuel sessions. Better burning without objectionable fly-ash dispersion was the objective of research on a vibrating-grate-type stoker, and suitability for small industrial applications was a consideration for the other type of stoker with jet-ignition and a hydraulically driven redesigned chain-type grate.

Available components, although desirable, proved inadequate for the packaged steam generator which was put into operation a year ago by Bituminous Coal Research, Inc., and many completely new units were developed.

Various solid-fuel chars, petroleum cokes and gases, wood and vegetable wastes of a number of kinds were all considered in the by-product utilization review.

Gas-Turbine Power

The ASME's first gas-turbine progress report, issued in 1952, predicted that the gas turbine would find its own special field in industry. Papers presented at the 1957 Annual Meeting showed that this prediction has been fulfilled.

The stationary gas turbine, aside from its inherent virture as a self-contained prime mover, fits into the process industries in unique fashion. It can be integrated into a process. It is found burning waste-product gases, supplying compressed air bled from its compressor unit, supplying thermal energy from its exhaust. Here, as in gas-line pumping, its ability to operate on low-calorie, high-volume fuel flow often makes it the one right choice.

In the field of aircraft turbines, the small power plant (100 to 600 hp) came in for discussion. Papers from Boeing and AiResearch reported on such turbines, both as propulsion units and as auxiliary power (for heating, electrical power, hydraulic power, deicing, main-engine starting). As a main propulsion unit, the small turbine will make possible new plane types which have been impractical, in the past, due to lack of engines of such high thrust-to-weight ratio.

The closed-cycle gas turbine, discussed in a joint session with the Nuclear Engineering Division, may well be the coming prime mover for power stations. Two papers took up factors affecting the use of the gas turbine in nuclear plants. Advantages will be high capacity for a given size and weight, wide range of loads, safety—since heat can pass from the reactor into the working fluid without release of radioactive gas to the atmosphere.

Heat Transfer

Galileo would have been amazed. Indeed, engineers who were leaders in the field as recently as 20 years ago, find fascination in today's science of heat transfer. Demands made on the heat-transfer engineer have multiplied, and multiplied again, since World War II. Nuclear power; the new high-speed aviation (that nose cone displayed by President Eisenhower in his talk to the nation—how did it re-enter the atmosphere and return to earth unburned?); the new heat-transfer problems in the refining of oil, and in other process industries; these, and many other new developments, raise thermal stumbling blocks that can be removed only by the heat-transfer engineer.

The kind of papers? Elastic thermal stresses in heating and cooling of slabs and cylinders; radiant heating of transparent materials, temperature profiles in radiant-cooled turbine wheels; thermal stresses in the skin of hypersonic vehicles with variable boundary conditions (How did Russia solve the missile-heat problem?). Thirty papers in all.

Hydraulics

The Hydraulic Division held a symposium on the effect of velocity on cavitation damage, a subject extensive enough to require two sessions for its coverage.

Another symposium took up the subject of "Welded Spiral Cases, from the Consulting Engineer's and the User's Viewpoint," bringing out comparative costs between riveted and welded spiral cases, and the comparative head loss of the two types.

One of the technical papers demonstrated the successful use of electric-analog-computing techniques in the simulation of typical hydraulic systems.

The validity of the simulation depends on the ability of the analyst to describe, realistically, the behavior of the elements of the system. The computer will solve only the engineer's analytical interpretation of the system. Another paper discussed the subject of foundations for vibrating machinery, such as compressors. The behavior of soil under static and vibrational loads, and the magnitude and effects of soil distortions, were considered.

Hydraulic controls received further investigation in several papers—hydraulic controls of grinding machines, hydraulic servomotors, a hydraulic dampener and a hydraulic servo valve for pulse-length modulation operation.

TECHNICAL SESSIONS

Participants, *described left to right,* are: 1 J. R. Johnson, Assoc. Mem. ASME, who delivered a paper on nuclear-gas turbines. 2 Another paper on that subject was by H. A. Ohlgren, Mem. ASME. 3 Creep and other properties of two special British steels were presented by one of the authors, N. P. Allen, superintendent, metallurgical division, National Physical Lab., England, at *left.* With him are H. L. Solberg, Mem. ASME, chairman; and J. F. Ewing, author of a paper on Croloy 15-15-N. 4 A joint Power-Nuclear session; J. L. Everett, Mem. ASME, and vice-chairman; C. T. Chave, Mem. ASME, and chairman; P. R. Kasten; V. S. Musick, Assoc. Mem. ASME; *second row,* J. H. Helve, Assoc. Mem. ASME; Stuart McLain; C. F. Cheng; H. A. Cataldi. 5 Eight papers from the IMechE Conference on Lubrication and Wear were presented by reporter J. G. Withers, British Petroleum Company. 6 Formulations for computer interpolation of the Keenan and Keyes Steam Tables was the topic of four papers for which the famous M. I. T. team were present. J. R. Madsden; W. J. Pfeifer, Jr.; F. G. Keyes, Mem. ASME; G. J. Silvestri, Assoc. Mem. ASME; W. G. Steltz, Assoc. Mem. ASME; J. H. Keenan, Fellow ASME; *second row,* A. C. Holmes, Mem. ASME; H. C. Schnackle; J. D. Andrew, Jr., chairman; and R. S. Hollitch.


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Instruments and Regulators

The mathematicians who carry forward the exacting work of instrumentation and regulation came forward with 16 papers. In a session held jointly with the Aviation Division, instruments for aircraft and turbojet development were discussed (photographic recording, oscillographic recording, magnetic tape, telemetering) with a description of the techniques employed. Future proposed instrumentation systems were outlined. A paper from the Goodyear Aircraft Corporation discussed the design analysis of a helicopter rotor-speed controller.

From M.I.T. came a study of the interpretation of dynamic measurements of physical systems—what kind of tests to apply, how the tests may be carried out, and how to interpret the results. Possible methods were organized into a pattern. At the same session, the pen-and-chart recording instrument came under scrutiny. Pen balance, and torque-and-damping characteristics of the instrument, were found to affect the responses appreciably, but other factors, such as chart speed, type of ink, ink level, temperature, and humidity, did not.

Lubrication

A series of four papers on the pressure-viscosity effect, based upon the full report of the ASME Research Committee on Lubrication, were presented. The experiments determined that pressure and temperature coefficients are related or dependent on the same physical-chemical or structural parameters, and that the effect of pressure on viscosity is related to molecular size and shape. This can be described through the viscosity and density of a lubricant, and in general the p-v effect increases as viscosity and as density increase. In the 32 to 300 F temperature range, ASTM charts describe the viscosity-temperature behavior of lubricants up to at least 100,000 psi. Sharp breaks in correlation curves occur between low and high-viscosity temperature response for lubricants of a given viscosity series. A proposal for further research was submitted.

Other papers were presented by a reporter from the IMechE Conference on Lubrication previously held in London, England, Oct. 1–3, 1957.

Machine Design

This was the year the human factor came in for emphasis in machine design. First, the designer, himself. Where are we to find engineers of creative ability—and how are we to induce them to make careers of designing?

Two papers faced up to these questions; one on methods of spotting the creative student, the other on the teaching of creative engineering to likely prospects.

The responsibility for human factors in the design of the machine was brought forward, introducing the new field of Human Factors in Engineering. More and more, the machine must take account of human abilities, limitations, habits, and preferences.

There were papers on product development, broaching the subject of co-ordination of departments in the medium-sized company—distinguishing between the functions of research and engineering. Where there are a number of plants and a number of products, this can be a difficult problem.

On the side of hardware, there were papers on adjustable gear ratios, spiroid gearing, spring back of coil springs, fatigue of steels, overrunning clutches, preload of ball bearings. There were discussions of the impact of numerical control on machine design; and the digital computer appeared as a means of calculating the dynamics of cam form. A paper took up three-dimensional photoelasticity in application to machine design.

Management

In addition to a session on the work of the specialist in management and the changing roles of management engineering and architecture in the age of automation, the Management Division was cosponsor of two sessions.

One was on the "Human Factors in Engineering," which dealt with the physiological effects of changes in environment such as vibration; and evaluation of the actual work performed in certain manufacturing operations. The difficulty of balancing speed-ups in efficiency against labor-saving devices is one of the factors which makes actual work determination difficult. The relationship to engineering design, and the establishment of a working program for this relatively new field were outlined in this session jointly sponsored with Machine Design and the newly formed Human Factors Society of America.

The other session, with both Machine Design and Education as joint sponsors, considered the human-factors responsibilities of design engineers, the selection of potential machine-design engineers, and the development of creativity in engineering.

An experimental course developed at the University of Minnesota and how industries and colleges collaborated in devising aptitude tests at Iowa State College were discussed.

Nuclear Engineering

All sessions of the Nuclear Engineering Division were joint, taking advantage of the Annual Meeting as a means of bringing together research in several related fields.

High-temperature gas-cycle-reactor power systems, and component optimization for nuclear-powered closed-cycle gas-turbine power plants were topics of a joint session with the Gas Turbine Power Division.

Although the X-10, the first reactor to start at Oak Ridge in 1944, was gas-cooled, the large quantities of helium required made it necessary to switch to water at that time, as pointed out by the session chairman. A second gas-cooled reactor was developed at Brookhaven, and the X-10 was to have been the prototype for the Hanford project with design for 1400-psi 740-F operation. The British White Paper in 1946 favored the gas-cooled plant for Windscale because of the density of population in the vicinity. The French G-1 and G-2 were both gas-cooled.

The papers presented pointed out the practical utility of the gas-turbine cycle for 5 to 50-heat-mw plants, since they are smaller in size, deliver more power per mw of reactor heat, require no elaborate water-treatment or auxiliary systems, and have a lower fuel cost.

Metallurgical design and fabrication problems in reactor vessels, a silver-indium-cadmium-alloy control rod for pressurized-water reactors, and the effect of grain size on ultrasonic attenuation in forged steels were topics jointly with the Metals Engineering Division.

Power and Instruments and Regulators Divisions were joined for component-design considerations, and operating-experience papers. This session also considered a comprehensive method of analysis of steady-state thermal design for pressurized-light-water-cooled and moderated cores; and analog simulation of steam-surge-tank transients.

The design bases of thermal and dynamic stress analysis of various reactor components were considered in another session jointly sponsored with Applied Mechanics.

Power

The Power Division again stressed its researches into the causes of turbine-rotor bursts. Conclusions of the ASTM Task Group, organized to investigate these failures, were reported. Ultrasonic techniques and interpretations were found to be still in the development stage, but of value, and the ASTM's Steel Committee has prepared a "Tentative Proposed Method for Ultrasonic Examination."

More attention will be given to brittle failure in analyzing rotor troubles, and lower normalizing temperatures must be used. Lower carbon, higher nickel and chromium, and adjustment of molybdenum and vanadium contents are also called for. New methods of testing are needed, although the transition temperatures obtained by breaking Charpy V-notch impact specimens are the most reliable, and are universally employed.

Ultrasonic testing, augmented by radiography, was also advocated for inspection of high-pressure pipe weldments. Ultrasonic methods will locate root cracks that are undetectable by radiography.

Water treatment was the subject of several papers, one a comprehensive review of experience and practice for supercritical and nuclear applications. Another detailed the observed effects of deposits on steam-turbine efficiency.

Developments in computer technology, coupled with more complete instrumentation of power plants, will provide more efficient operation. Computers have been used for interpolating the Keenan and Keyes steam tables for 1F increments. Some "first step" hints for digital computation were based on more than three years of operating experience.

Nuclear power was considered from the safety aspects; thermal efficiency, erosion, and corrosion from the higher moisture and oxygen concentration to be found in the Dresden Boiling Water Reactor.

Process Industries

Theoretical methods valuable in process-industry application, and two specific

applications of process engineering—incinerator design and continuous pump control—were topics of the Process Industries Division sessions.

The application of statistical-control methods and the use of a logic diagram to verify known facts and objectives, as well as the nature of surface heat flow along fins and the applicability of the Nernst heat theorem were the theoretical considerations.

Mathematical methods, computational-numerical means, and electrical simulation were applied to the heat-flow problem. Recent emphasis on low-temperature research has made the Nernst theorem of paramount importance for applications to process engineering. A determination was made of the limitations under which it can be considered a basic scientific law in view of a half century of experience.

Railroad

The Railroad Division report on "Progress in Railway Mechanical Engineering, 1956–1957," dealing mainly with new developments in rolling stock, will be published in MECHANICAL ENGINEERING. A new freight locomotive is among the rolling-stock developments.

Union Pacific's experience with a fleet of 25 gas-turbine-electric locomotives in fast-freight service has led to the design of an 8500-hp unit now being evaluated in operation. The extreme service conditions require this horsepower, almost equal to five 1750-hp diesel-electric units, at 6000-ft altitude and 90 F inlet temperature.

Other design papers presented the latest technology in the riding comfort and testing of passenger cars, and the development of a satisfactory method of mechanical refrigeration that would increase the ratio of 2366 mechanical cars to the 125,000 now using the old water-ice method. Several papers went into the problems of improving rail adhesion and the starting of trains. Purchasing and operational problems were also considered.

Rubber and Plastics

The Rubber and Plastics Division presented new developments in rubber compounding as applied to conveyer-belt construction and to rubber airsprings, with their enormous potential. Rubber airsprings offer the advantages of air as a load-carrying medium without the faults of rubber alone. Owing to their nonlinear characteristics, airspring suspensions can be made to approach the ideal spring curve; that is, one that is soft in the region where it is normally used, and then becomes progressively stiffer as it is compressed (jounce) or extended (rebound). Other important advantages are light weight, small size, less noise transmission, lateral stiffness, and long life. They are presently being incorporated into conventional suspension designs.

The recently constructed Monsanto plastic house has demonstrated that technical data, available on plastic materials, can be used to apply engineering principles of construction in the same manner as for standard materials.

An instrument was described, newly developed to measure flow characteristics of polymer melts at shearing rates over the range 1 to 10,000 reciprocal seconds, and over the temperature range 70 to 700 F. Other papers offered basic equations developed for the tensile design of reinforced plastic, and an extension of the method of predicting creep in bending, from data on creep in tension and compression when coefficients are equal.

Dinners and Luncheons

President's Luncheon

The President's Luncheon, held on Monday, is the high-light event that each year sounds the note of the Annual Meeting. J. W. Barker, past-president of ASME, presided. In his discussion on the theme of the meeting, "New Knowledge to Create Tomorrow's World," Dr. Barker said, "the wellspring of tomorrow is the education of our youth today."

William F. Ryan, outgoing ASME President and principal speaker, considered America's problem of maintaining technological superiority over an ever-expanding technology and appraised the situation as follows:

"You cannot feel any terror for the future of this country," he said, "if you know the caliber of the engineering students coming along to take their places in industry."

He related that during the past year his visits to several ASME student functions held at various places throughout the United States confirmed his opinion that the students are "magnificent," despite the reservations expressed by some educators. He added that the engineering profession as a whole, however, suffers from a "blind spot," and that the engineering profession would be strengthened if more engineers became aware of their professional responsibilities.

He stated that the established members of the profession not only are unaware of their own professional obligations, but that little is being done to see that young engineers take away from college any concept of why they have prepared themselves for an engineering career." They do not know the attributes of the profession or of a professional practitioner," Dr. Ryan said.

Such knowledge, he commented, usually can be attained only by "sheer osmosis" and association with older engineers. He believes the best way to eradicate the blind spot is through active participation in Society committee work and working with Engineers Joint Council and Engineers' Council for Professional Development. Regarding progress toward unity of the profession, Dr. Ryan urged his audience to read M. S. Coover's report published in MECHANICAL ENGINEERING, July, 1957, page 693.

The occasion added another facet when C. E. Davies, retiring secretary, ASME, expressed the good wishes of the Society and staff to J. M. Clark, who re-retires at year's end as Divisions Manager. Mr. Davies briefly noted that during Mr. Clark's 38 years of faithful service to the Society he had been editor of "Mechanical Catalog," from 1919 to 1953, when he took over the duties of Divisions Manager. In presenting to Mr. Clark a beautifully bound volume of letters from his friends, Mr. Davies chose to read his own letter which was an eloquent tribute to Mr. Clark's contributions to the Society and his cheerful help to the members.

The Lecturers for 1956-1957 were then called on to be recognized and receive certificates for their efforts to bring the latest engineering developments to engineers in the farthest corners of the United States. Among those present were: J. K. Dillard, O. E. Homeister, P. W. Swain, and T. O. Jones. Prof. J. P. den Hartog, who was in Europe, could not attend. W. H. Brandt and N. L. Bean, who lectured on automation in Russia, were absent; also Mr. Bean, due to the pressure of business, and Mr. Brandt, because of his untimely death on September 17, in Saratoga, Calif.

This year, due to the tragic death of Mrs. U. A. Rothermel, President, Woman's Auxiliary to The ASME, Mrs. R. W. Worley, First Vice-President, reported on the fine work being done by this group of more than 1700. She paid moving tribute to Mrs. Rothermel and her able leadership. Her report showed that the Sections are growing in number and the work being done in the scholarships and loan funds help "young engineers to walk in an era when we fly like birds and swim like fish."

Also introduced were members of the Council. Those re-elected to serve a second term included E. O. Bergman, a director (Codes and Standards), and C. E. Crede, Vice-President, Region I. The following had completed their term of office: F. L. Bradley, director (Administrative); R. B. Lea, director (Technology); F. W. Miller, Vice-President, Region III; B. T. McMinn, Vice-President, Region VII; L. K. Sillcox, past-president; and A. C. Pasini, Vice-President, Region V (was not present). Other members of the Council present included: W. H. Byrne, Vice-President, Region II; J. H. Sams, Vice-President, Region IV; R. S. Stover, Region VI; and C. H. Shumaker, Region VIII; and new members: A. W. Weber, Vice-President, Region III; E. W. Allardt, Vice-President, Region V; and H. S. Aurand, Vice-President, Region VII.

Fuels-Nuclear Engineering-Power Luncheon

Lewis L. Strauss, chairman of the U. S. Atomic Energy Commission, who was to have been the joint Fuels-Nuclear Engineering-Power luncheon speaker on Tuesday, received a "priority" directive from the White House to attend a meeting on NATO strategy. Jesse C. Johnson, director of raw materials for the AEC, spoke in his place, on the need for fossil and nuclear fuels in future energy requirements.

He stated, that while the AEC has tried to project power demand into the era

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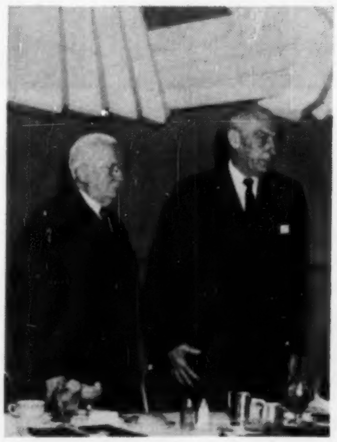

LUNCHEONS AND DINNERS

The President's Luncheon and the Fuels-Nuclear Engineering-Power Luncheon: 1 ASME President W. F. Ryan, speaker, and Mrs. R. W. Worley, president, the Woman's Auxiliary to the ASME. 2 ASME President Ryan and past-president J. W. Barker. 3 ASME Secretary C. E. Davies, presents letters of appreciation to J. M. Clark, retiring Divisions Manager as Mrs. Clark looks on. 4 Head table at the President's Luncheon. 5 J. C. Johnson, AEC director of raw materials, speaker at the Fuels-Nuclear-Power Luncheon.

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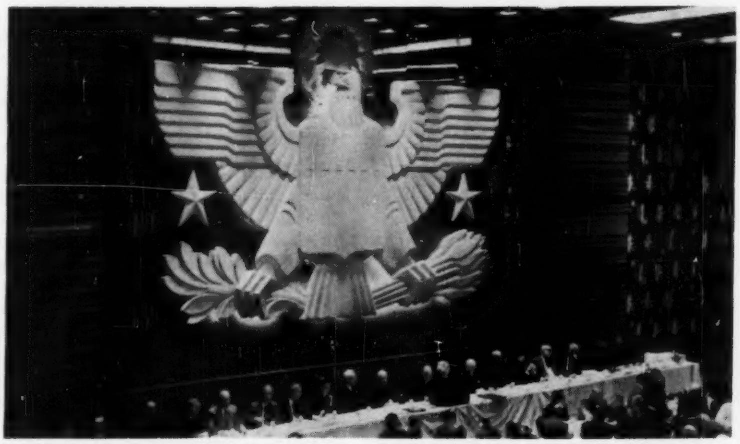

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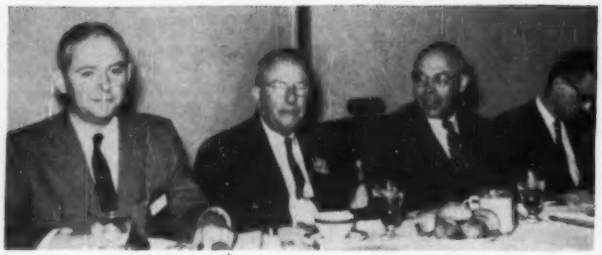

when automation will have eliminated both unskilled and semiskilled labor, a more realistic and immediate problem has been the development of a program for the next 30 years.

The first decade will be occupied in the American program by research and development of prototype and first commercial plants. Fossil fuels in this country are adequate for some time, although the U. S. has consumed 50 per cent of her coal since 1920, and 50 per cent of her oil since 1940.

Worldwise, Mr. Johnson stated, the picture is different. Western Europe desperately needs new sources of energy, particularly with the vulnerable position of Near East sources. In coal equivalents, Great Britain imports 37 million tons annually, at $70 million. The present $2 billion cost of imports for the Euratom countries will triple by 1977. Japan will need 100 million tons by 1970.

Comparative cost of nuclear and fossil fuels is a major factor, less important in Europe, where power now costs 10 to 12 mills, but significant in the U. S. where the 5 to 7 mills per kwhr for coal compares with 10 to 12 mills for nuclear power. Parity can probably be reached in the U. S. in the next 10 or 15 years, and perhaps sooner. This will be accomplished in spite of the fact that efficiency in fossil-fuel generation has improved so much that the cost in mills is the same as 30 years ago.

World resources of uranium, largely discovered in the past three or four years, are 1 million tons, with 2 million tons in a "reserve" category, of which the U. S. has 200,000 tons. Some idea of the potential energy represented is given by the fact that theoretically 1 ton of uranium equals 2.7 million tons of coal. At present, energy utilization of nuclear fuel is 1 per cent, with 5 per cent or more practical in the near future, and perhaps total utilization possible eventually.

All of Europe's additional power is not replacement but an implementation of fossil fuels, and our pattern may be similar. Nuclear fuel processing now consumes large quantities of power from fossil fuels which may be more than offset by nuclear process heat applications which are just beginning.

Mr. Johnson was introduced by Joseph W. Barker, past-president of ASME and chairman of the board, Research Corporation. Earle C. Miller, chairman, ASME Fuels Division, and research engineer for the Riley Stoker Corporation, presided.

Heat Transfer Luncheon

The Heat Transfer Division held its annual luncheon on Tuesday. Some 100 members of the Division heard Rear Admiral W. D. Leggett, Jr., USN (Ret.), vice-president of Alco Products, speak on "The Heat-Transfer Engineer in Today's Engineering Activity."

As Chief of the Navy's Bureau of Ships, Admiral Leggett was instrumental in pushing to completion the Navy's first atomic submarine, the *Nautilus*, and the super-carrier *Forrestal*. Prior to that, he had been Commander and Director of the U. S. Naval Engineering Experiment Station at Annapolis. He has thus been intimately associated with all types of machinery and thermal equipment.

Admiral Leggett defined the heat-transfer engineer as the man who "conserves heat in a process, recovers heat for practical application, and dissipates the waste heat. . . . he must take the blame for introducing condensers, feedwater heaters, fuel-oil heaters, air preheaters, and bleeding reheaters. . . . . he may also take some of the credit for the fact that, because of the efficiency thus promoted, we enjoy the cheapest electricity and the highest standard of living in the world."

"The thermal engineer," he said, "needs basic research data as much if not more than the other branches of engineering. Design formulas and thumb rules are not nearly enough to cope with the thermonuclear, missile, or even jet temperatures we have had thrust upon us in the past ten years."

Admiral Leggett felt that it would be easier, today, to convince educational authorities that the country really wants increased emphasis on science. He strongly advocated some system which would permit the more capable student to get the advantage of early scientific training.

A comment came from L. M. K. Boelter, Dean of Engineering at the University of California. Dean Boelter expressed his belief that engineers should appear on boards of education—not merely be present at parent-teacher meetings—and bring their knowledge of science and their enthusiasm for science to bear on the problem of the primary and secondary schools. (Former President Herbert Hoover has gone on record that our secondary schools are heavily to blame for the failure to teach and inspire the potential engineer.)

Sigmund Kopp, Mem. ASME, of Alco Products, and retiring chairman of the Heat Transfer Division, presided.

Management Luncheon

Engineers and scientists bear the responsibility not only for achieving technical progress, but for helping to guide society through the complex situations

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LUNCHEONS AND DINNERS

1 View of Management Luncheon head table shows J. N. Landis, incoming ASME President, J. A. Willard, Fellow ASME, who presented H. F. Smiddy for the Henry Laurence Gantt Gold Medal. Mr. Smiddy was principal speaker. **2** Sigmund Kopp, Heat Transfer chairman, discusses luncheon program with Rear Admiral W. D. Legget, Jr., USN (ret.), speaker. **3** R. B. Smith, Fellow ASME, receives certificate of Fellow grade in the Society from J. S. Rearick, Petroleum Division Chairman. Mr. Smith delivered luncheon address. **4** W. F. Ryan congratulates S. P. Timoshenko, first Timoshenko Medalist, at Applied Mechanics Dinner. **5** W. A. Shoudy, Fellow ASME, chairman, Old Guard, and Mrs. G. M. Reynolds, look on as G. M. Reynolds receives Old Guard Prize from J. N. Landis.

created by advances in science, according to Harold F. Smiddy, vice-president of the General Electric Company, in his address on the acceptance of the Henry Laurence Gantt Gold Medal, awarded for outstanding achievement in the field of management.

Speaking on the topic of "Engineer-Manager Relationships" at the Management Luncheon on Tuesday, he urged engineers to take a deeper interest in policy decisions that are often left to managers. "We cannot, with realism, separate our work from its purpose, no matter how intriguing, fascinating, or self-satisfying the nature of that work may be."

He continued: "I don't see how you can turn your manager into a kind of seeing-eye dog to pick out your course for you, unless you admit in doing so your own blindness to the choice of the path to be followed, and your interest only in progressing along that path with maximum technical skill, no matter where, in what direction, or to what disastrous end such chosen path may lead.

"This gets directly to the heart of my deep qualms about the present course of communist scientists—and not one whit less about those scientists and others here in our own country who would have us now imitate the Russian approaches; rather than be creative enough, and—as Gantt so urgently pressed—industrious enough, to make greater progress by nobler ends."

R. G. Hess, Mem. ASME, and vice-chairman of the Executive Committee of the Management Division, presided. The recipient was introduced by John A. Willard, Fellow ASME, and partner, Bigelow, Kent, Willard & Company, New York, N. Y., and presentation was made by J. A. Handy, Jr., chairman, Gantt Medal Board.

Petroleum Luncheon

"American petroleum engineering leads in standards," said R. B. Smith, a director (technology) of ASME, addressing the large Petroleum Luncheon audience on Tuesday. Those standards, he added, are known throughout the world.

While some may look ahead with trepidation to the future of fossil fuels in an atomic age, how many are aware of the tremendous contributions made by petroleum engineers to United States technology? he asked.

This is a unique contribution, he said. In fact, it is not easy to distinguish any other world economy in which the technical contribution has been so nationalistic. He stated, "We have created and developed the processes, we have established the principles of design, and we have set the standards of performance."

The ASME and its Petroleum Division, as one of the few cohesive technical and professional leaders, has a particular responsibility to help maintain this supremacy.

He cited the three phases economic historians use in distinguishing progress: creative or inventive, developmental or commercially economic, and productive or competitive. The petroleum industry has passed the creative phase and now the competitive phase begins.

"It is reasonable to assume that we are running toward the competitive stage," said Mr. Smith, vice-president, The M. W. Kellogg Company, "where the premium on technical and economic efficiency is high and where the contribution of the engineer in rationalization and fundamental thinking is enhanced."

If the petroleum engineer is to accept this challenge, he must assume responsibility in three catagories: In his practice as an engineer; in his professional society, as a member of a technical and professional body in the field; and as a professional person in a world economy.

Speaking about the technical challenge, Mr. Smith said, this problem resolves itself into the elimination of overly conservative practices, redundant procedures, and compounded safety factors which presently plague the practice. He further added that the petroleum industry should now, at the threshold of the competitive stage, seek economic proficiency in the following areas: instrumentation, fractionation, and power utilization.

The Society challenge was carefully examined. Mr. Smith observed that nearly all of the professional societies are engaged in technical and scientific work for the public interest. The ASME contribution through its Boiler Code is something more. It is charged with examining construction, assessing service conditions, and establishing design principles—all in the interest of public safety. This is neither a light nor an easy responsibility. It must be discharged under a continuously living and growing concept or the result can be oppressive and detrimental to technical development. He believes the challenge in this area is not easy. To be met it must direct thinking to the clearly stated preamble to the Code and eliminate the confusion, extend the scope, and provide acceptance for advanced thinking, eliminating restrictions of procedures and short-sightedness of vested interest

The professional challenge, stated Mr. Smith, is probably most difficult of all since it is universal in scope and it is attenuated by the unique world-wide stature of petroleum engineering. The

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practice of the art of engineering dates back to antiquity; however, not always in the public interest. Since the industrial revolution, and with ever-growing emphasis, the foundations for professional practice have been laid on a basic tenet, fear of God and service to others. In the public eye more is required. The profession must impose self-regulation—self-regulation in the training of the young; self-regulation in the admission of practitioners; and self-regulation in the control of professional ethics.

We will attain professional stature, he concluded, only when we earn and deserve it.

J. S. Rearick, chairman of the Petroleum Division Executive Committee, served as toastmaster of the luncheon. He presented Mr. Smith with the Certificate of Fellow grade in the Society by direction of the Council.

Applied Mechanics Dinner

On Tuesday evening the Applied Mechanics Division gave a dinner devoted to honoring Stephen P. Timoshenko of Stanford University, Stanford, Calif. Held at the Men's Faculty Club, Columbia University, the dinner was presided over by Miklos Hetényi, retiring chairman of the Division.

Dr. Hetényi opened the event by welcoming some of the Division's past-chairmen, among whom were: John M. Lessells, Hon. Mem. ASME and Honorary Editor of the *Journal of Applied Mechanics;* Hillel Poritsky, consulting engineer, General Electric Company, Schenectady, N. Y., Martin Goland, editor of *Applied Mechanics Reviews;* and Timoshenko, who had been the Division's first chairman. He then introduced the new chairman, Walter Ramberg, chief, Mechanics Department, National Bureau of Standards, Washington, D. C.

The meeting was then turned over to William F. Ryan, retiring ASME president. Mr. Ryan, in paying tribute to Timoshenko, said that in 1914 he met the noted engineer in spirit through reading his paper, "Stability of Elastic Structures," and was now honored to meet him in person. Mr. Ryan reviewed some high lights of Timoshenko's career, remarking also how Timoshenko had learned the English language by reading Love's "Theory of Elasticity."

The chief event of the evening then followed — the presentation of the Timoshenko Medal to Stephen P. Timoshenko, its first recipient.

Dr. Timoshenko, after accepting the honor, gave a talk on engineering education in Russia. Before the Revolution, he said, every pupil dreamed of being an engineer, but the requirements were so strict for graduation that only a minority passed. The standards were of the highest. However, after the Revolution, higher education was destroyed and the engineering schools lost their academic freedom. Class-consciousness was introduced, and only children of peasants and artisans could enter the schools. In the following years, when Russia needed engineers. there were no engineers.

In the 1920's, Timoshenko remarked, however, changes were made by the reintroduction of class distinction, and the best young men entered. Science and mathematics were included in the curriculum, and the requirements for entrance became stricter than before. Concentration was in special fields—mechanical engineering, electrical engineering, and others. The engineering course, he stated, lasts five years, with severe two-year studies in kinematics, dynamics, mathematics, and physics. In the final year the student specializes in design only, no lectures. During these five years no vacations are allowed. The engineer spends his summers in practical work; a railway engineer arranges for work on a railroad, for example.

Dr. Timoshenko pointed out that the Candidate's Degree, obtained after three years, has great distinction in Russia. Later, the Degree of Professor commands not only greater distinction but also a salary ten times that of a skilled workman. Vacancies for these Professorships are announced in the newspapers, and there is great competition for them.

The speaker concluded by stating that perhaps Russia leads in the field of nonlinear vibration.

Following the talk by Timoshenko, Mr. Ryan concluded the evening by presenting a Certificate of Appreciation to Miklos Hetényi, in testimony of the high

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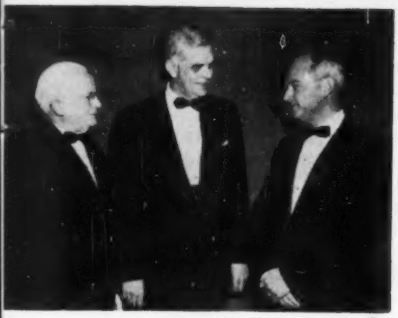

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ANNUAL BANQUET

1 E. G. Bailey, *center*, only engineer upon whom ASME conferred Honorary Membership in 1957, is congratulated by C. E. Davies, *left*, retiring secretary, ASME, and O. B. Schier, II, secretary, ASME. **2** Honorees gather before banquet. *Left to right*, C. S. Draper, Holley Medalist; S. P. Timoshenko, first Timoshenko Medalist; William Prager, Worcester Reed Warner Medalist; and L. M. K. Boelter, ASME Medalist. **3** K. J. Trigger and Bei Tse Chao being congratulated upon receiving Blackall Award by F. S. Blackall, Jr., donor of award. **4** W. F. Logeman, winner of Arthur L. Williston Medal and Award, shown with W. C. Edmister, Richards Memorial Award Winner; C. M. Leonard, who represented Pi Tau Sigma; and Pi Tau Sigma Gold Medal Award winner, P. H. McDonald, Jr. **5** J. N. Landis, *center*, with Prime Movers Committee Award winners, R. L. Bartlett, *left*, and Heinrich Hegetschweiler. **6** W. F. Ryan welcomes Banquet Speaker, H. T. Heald, as J. N. Landis observes. **7** R. D. Bowerman, *center*, Alfred Noble Prize winner, chats with G. R. Fryling and R. E. Abbott.

regard in which he is held and for his work in advancing the field of applied mechanics.

Hydraulic Old Timers Dinner

More than 150 "old timers" gathered on Tuesday evening for the Annual Hydraulic Division dinner. There were, however, many "young timers" among the group—mostly from that important portion of the field that serves the aircraft industry with hydraulic accessories.

The program was strictly informal. Prof. George Wislicenus and Prof. A. Hollander acted as joint toastmasters. As part of the program, retiring chairman Dr. J. W. Daily was awarded a Certificate of Appreciation for his work on the executive committee for the past five years; and Prof. R. G. Folsom was honored with the announcement of his promotion to the grade of Fellow in the ASME.

Featured as main speaker at the dinner was Prof. Howard W. Emmons, Mem. ASME, of Harvard University, who gave a satirical talk on "where do we go and how do we get there." In a humorous vein, he outlined the problems to be surmounted in getting man to such places as the Moon, Mars, Venus, etc.

Members and Students Luncheon

Some of the oldest and youngest members of the Society were present at the Members and Students Luncheon on Wednesday at which three of the Society's younger members were awarded prizes.

Presiding over the events was retiring ASME President, William F. Ryan, who introduced those seated at the head table among whom was incoming ASME President, James N. Landis. Mr. Landis later presented the awards.

The Undergraduate Student Award winner, William A. Olsen, Jr., Assoc. Mem. ASME, was announced by J. Stanley Morehouse, chairman, Board on Honors. Mr. Olsen, whose paper, "A Visual Study of Two-Dimensional Manifold Flow Mechanics," won him the award, is currently in Texas on service assignment. Robert Babbit, Student Member, University of Connecticut, Storrs, Conn., a former classmate of Mr. Olsen's, accepted the award from Mr. Landis.

Joseph F. Hunter, Assoc. Mem. ASME, received the Charles T. Main Award for his paper, "A Critical Analysis of Student Sections of National Engineering Societies."

Before introducing the Old Guard Prize winner, William A. Shoudy, Fellow ASME, explained the activities of the Old Guard. He asked the members of the Old Guard to rise that the audience might glimpse a group of men who are old but not aged. These men remain young through their work for the youth of the Society.

The Old Guard Prize went to George M. Reynolds, Student Member. His paper, "Computer Control of Machine Tools," was chosen from among over 100 papers presented by Student Members at Regional Conferences throughout the country. Mr. Reynolds then delivered his paper which appears elsewhere in this issue of MECHANICAL ENGINEERING. Patrick H. McDonald, Jr., Assoc. Mem. ASME, research professor of mechanical engineering, North Carolina State College, Raleigh, N. C., recipient of the Pi Tau Sigma Gold Medal Award, also gave an address. In his talk, "Anomalous Response of Dynamic Strain Gage Circuits," Mr. Reynolds described efforts that were made to test the Donnell-von Karman hypothesis of plastic strain-wave propagation in solids. He concluded with the following significant observations about research:

1 Research results cannot necessarily be produced on demand or on schedule.

2 No amount of money alone guarantees that research results will be obtained.

3 Significant results can be obtained by people who are motivated by an urgent desire to know the unknown; who are willing to work; and who have some simple aptitudes for the job they are doing. These aptitudes include a sense of perfection, a love of symmetry, and an appreciation for form and geometry. Beyond this, a researcher must be a good professional companion willing to contribute to the efforts of a team.

Annual Banquet

The Annual Banquet is the occasion of occasions of the Annual Meeting—the Society "parades its colors."

ANNUAL BANQUET

1 H. T. Heald, Mem. ASME, president, Ford Foundation, delivers address on "The Creative Mind." 2 S. P. Timoshenko, Hon. Mem. ASME, greeted by W. P. Ryan, outgoing ASME president. 3 Alfred Iddles, recipient of ASME George Westinghouse Gold Medal, chats with H. F. Smiddy, who was awarded Henry Laurence Gantt Gold Medal. 4 Westerners meet at banquet, L. M. K. Boelter, and J. N. Landis. 5 G. M. Reynolds, Student Member, ASME, recipient of the Old Guard Prize, is congratulated by C. S. Draper, Holley Medalist.

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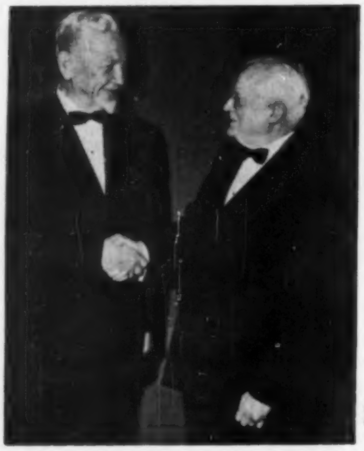

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This year more than 1300 engineers and their guests gathered on Wednesday evening to witness the conferral of its highest honor; to see the men chosen to receive its medals and awards; and to hear a "favorite son," H. T. Heald, discuss the creative mind. The parade further was distinguished when the audience paid tribute to retiring Secretary, C. E. Davies, and viewed the "new" Secretary, O. B. Schier, II, "at work."

William F. Ryan, outgoing president and Hon. Mem. ASME, acted as toastmaster. The program of the evening opened with the invocation by Carl J. Eckhardt, Fellow ASME, professor of mechanical engineering, University of Texas, Austin, Texas.

Dr. Ryan opened the proceedings of the event, which this year was devoted to the inspiration of the creative mind, by announcing that George Westinghouse, 29th ASME President, famous engineer and inventor, and perhaps one of America's foremost examples of the creative thinker, has been enshrined in the Hall of Fame. Westinghouse is the second engineer to be so honored.

As living evidence of the current predominance of creative thought among engineers, Dr. Ryan cited, some 640 authors would have presented 400 papers on a wide range of subjects before the meeting came to a close.

Our affiliate, the American Rocket Society, who salute us as their "big brother," will have sponsored 100 of these authors. "I can remember when the first national meeting of ARS was held," he said. "I was dismayed that our dignified Society was offering aid and moral support to the group of visionaries who planned to fly to the moon. Well, they are on their way there, and that group of visionaries are responsible for a multibillion-dollar business and they comprise one of the most significant cores of creative thought in our country."

He also noted that the papers on lubrication and wear, originally given in London, England, and re-presented in part in Toronto, Canada, were part of the technical program of the Annual Meeting—"thus the Society continues a program of international exchange of technical knowledge."

Tribute to Davies. C. E. Davies, member of the staff since 1920 and Secretary of ASME from 1924 to 1957, was called to the rostrum so that the Society could pay tribute to his illustrious career. F. S. Blackall, jr., past-president and Fellow ASME, was chosen to do this honor, as well as to present to Mr. Davies "certain tokens of our undying gratitude and regard."

In his response, Mr. Davies expressed

appreciation to hundreds of committeemen, his staff, and to his successor extended "heartiest wishes for success." Speaking of the ASME secretaryship, he said, "I had the best job in the world, working with big-minded people looking up. But," he added, "I think I see a better job ahead of me. On January 1st I enter upon a new career with the United Engineering Trustees as Building Coordinator."

Comparing the present engineering home with the one visualized for the future, Mr. Davies observed that, "...as it was a gift, perhaps, throughout the years it was unappreciated by the profession generally. The new Center will come into being because of the efforts of many thousands of engineers and should correspondingly provide broader satisfactions."

"I am sure," he said, "that among your 45,000 members there are hundreds who in their hearts acknowledge their debt to their profession and will want to recognize that obligation by subscribing $2000 or more over the period of the next three years. There are also thousands among you who, I am sure, will wish to acknowledge their obligation by gifts of a total of $300 or more. And the younger men will want to invest modest sums in the future of their profession. E. G. Bailey has regretted that he had no opportunity to contribute his bit as a junior engineer to the present building. May you leave no unsatisfied future E. G. Baileys among your younger members."

Schier—New Secretary. The audience then met the new Secretary, O. B. Schier, II. Mr. Schier has been a member of the staff since 1946; in 1953 he was appointed an Assistant Secretary and a year ago was elected Deputy Secretary.

In accepting the plaudit of the assemblage, Mr. Schier responded as follows: "To be chosen Secretary of our great Society is an honor to be cherished. To be selected to carry forward the work of my mentor, my friend, and a great Secretary, Clarence E. Davies, is an honor to be doubly appreciated. I thank you from my heart."

The toastmaster then introduced the eminent engineers who represented affiliate professional societies, joint engineering bodies, and Founder and allied individual societies, at this event. Several telegrams were read from societies in foreign countries who could not be present this year.

Fifty and 65-Year Members. Fifty-year and sixty-five-year members of the Society were recognized. The fifty-year members included: W. C. Brinton, A. G. Christie, C. W. E. Clarke, H. V. Coes, G. E. Crofoot, John Darby, F. E. Eberhardt, Francis Farquhar, Walter Ferris, O. H. Fogg, F. M. Fuller, R. H. Henderson, R. F. Jacobus, H. J. Marks, N. T. McKee, H. T. Moore, V. H. Mueller, H. S. Philbrick, James Posey, Ejnar Posselt, Carl Rigdon, Lawrence Roys, G. B. Shipley, M. A. Stone, C. E. Sweet, C. P. Turner, and G. R. Wadleigh. The sixty-five-year members included: R. W. Boenig, H. W. Carter, F. A. Flather, W. F. Funk, Andrew Pinkerton, W. D. Steele, and F. D. Thomson.

New Council Members—the President. Also introduced were the new members of Council. They included: The four new Vice-Presidents, C. E. Crede of Watertown, Mass.; Arthur W. Weber, Corning, N. Y.; E. W. Allardt, Alliance, Ohio; and H. S. Aurand of Honolulu, Hawaii; and three Directors: E. O. Bergman, Alhambra, Calif.; L. N. Rowley, Jr., New York, N. Y.; and R. B. Smith, New York, N. Y.

One of the high points of the evening was the presentation of the incoming President of ASME, James N. Landis. Mr. Landis greeted the audience and thanked the members for the honor of this important office.

Old Guard. The members of the "Old Guard," composed of those of 35-year membership, were called on to rise and be recognized. Dr. Ryan lauded the efforts of the Old Guard, under the leadership of W. A. Shoudy, who again arranged for the winner from each of the 12 Regional Student Conferences to meet in San Francisco and compete for a national Old Guard Prize. Present were 20 Student Members from various Student Sections as guests of the Old Guard. He then introduced G. M. Reynolds, a student at Northwestern University, winner of this year's prize for his paper, "Computer Control of Machine Tools." Mr. Reynolds had presented his paper earlier in the day at the Member and Students Luncheon.

Honors and Awards. "The recognition of an engineer's work by his fellow engineers is his greatest reward for accomplishment," said Dr. Ryan. "This Society is proud of the honors it bestows and welcomes this opportunity to confer them before such a distinguished audience." The recipients were presented by Dean J. Stanley Morehouse, chairman of the Board on Honors. Two members of the Board, Dr. L. K. Sillcox, past-president ASME, and F. M. Gunby served as marshals. Secretary O. B. Schier, II, served as narrator.

The honors and awards bestowed previously during the 1957 Annual Meeting included: Undergraduate Student Award to W. A. Olsen, Jr.; Charles T. Main Award to J. F. Hunter; first Timoshenko Medal to Stephen P. Timoshenko; and Henry Laurence Gantt Gold Medal to H. F. Smiddy.

The honors and awards conferred at the Banquet were as follows: Alfred Noble Prize to R. D. Bowerman; Pi Tau Sigma Gold Medal Award to P. H. McDonald, Jr.; Richards Memorial Award to W. F. Logeman; Prime Movers Committee Award to Heinrich Hegetschweiler and R. L. Bartlett; Blackall Machine Tool and Gage Award to Bei Tse Chao and K. J. Trigger; Worcester Reed Warner Medal to William Prager; ASME George Westinghouse Gold Medal to Alfred Iddles; Holley Medal to C. S. Draper; and ASME Medal to L. M. K. Boelter.

Honorary Membership in the Society was conferred on but one member this year—E. G. Bailey, past-president of ASME, "creative engineer, inventor, who through sound engineering and dogged perserverance converted his inventions into useful tools of great value; engineering and industrial leader possessed of deep professional loyalty which he has translated into good works for great causes."

Additional information concerning the recipients and descriptions of the honors will be found in the article, "ASME Honors Engineers," on pages 88 to 96 in this issue.

H. T. Heald—Banquet Speaker. "As a result of recent international developments, science and engineering and education have been much in the news in the past two months," said Henry T. Heald, president of the Ford Foundation.

"It is now clear," he added, "that we have underestimated the speed of the Russian scientific and industrial development and that their progress presents serious dangers to the free world.

"Today there are two nagging concerns about science and technology," Dr. Heald said. "The first is that Russia is producing more scientists and engineers than we are. The second is that Russia's successful launching of the satellite has relegated us to second place in the enforced race for scientific leadership."

Dr. Heald does not minimize the propaganda advantage of our position, but does stress that neither numbers nor temporary setbacks are conclusive determinants of leadership in the long run. What is important, however, is what we are doing now—what we do in the future—to encourage, develop, and sustain the creative mind in science and engineering and in other fields as well.

"It is a tribute to the engineering profession," he stated, "that, in the midst of unprecedented popularity and tremendous pressure to multiply its efforts, many engineers have shown an increasing

1 Nuclear Dinner: From *left,* H. A. Wagner, R. A. Bowman, J. R. Menke, B. R. Prentice, T. Baumeister, W. E. Shoupp, F. K. McCune, A. Iddles, A. W. Thorson, Chas. George; Mr. Iddles is a Fellow ASME, all others are Mem. ASME. 2 B. R. Prentice, *left,* receives miniature reactor from W. E. Shoupp. 3 Textile Engineering Luncheon: From *left,* S. Patrick; F. M. Paget; J. F. Matthews, Mem. ASME; John Baum; N. M. Mitchell, Mem. ASME; Ray Parker; E. K. Swift, Jr.; K. P. Powers, Mem. ASME. 4 Theodore Baumeister, Nuclear Dinner speaker.

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interest in creativity. Creativity—the insight that makes possible unscheduled leaps forward—is the essential ingredient of all important achievements. It occurs often enough to give rise to the hope that, unlike genius, it may be acquired and developed. How does one identify the potentially creative person? Is creativity accidental? Can it be subjected to systematic analysis? Under what conditions is it most likely to flower? How can mere competence cross the gap to creative excellence?

"The need for creativity is not confined to engineering," Dr. Heald pointed out. "It extends to other fields not so hard-pressed for sheer numbers. There is no surplus of outstanding minds or effective leaders in any field. The quest for creativity now tends to focus on people when they have already begun their careers."

He suggested that major attention be shifted back to the years of formal education. It is during this period, usually the most crucial in the development of the human mind, that intellectual habits are formed, that the mind is primed for strenuous exercise, that vision can sweep over many fields before it must concentrate on one.

"The purpose of education," said Dr. Heald, "is the cultivation of the thinking man—to nurture to the fullest extent possible the development and enrichment of the individual mind; to develop the individual's ability to seek out and comprehend facts; to judge them in terms of implications and issues; to weigh and evaluate his findings and isolate alternatives; and to relate what he learns to his ideals, beliefs, and values.

"The responsibility for strengthening American education rests upon all of us—individuals and institutions alike," said Dr. Heald. He then related that this responsibility is felt keenly by all connected with the Ford Foundation, pointing out that about four fifths of more than one billion dollars granted thus far in the Foundation's 20-year history has gone to education.

He then discussed the program in science and engineering being developed by the Foundation. "The program," he said, "is only in its planning stages. But you can be sure that it will stress the development of the human mind, basic educational advances, and creative leadership that fits science and engineering into the framework of the total needs and aspirations of society."

Textile Engineering Luncheon

J. P. Baum, vice-president, J. P. Stevens & Company, Inc., Milledgeville, Ga., spoke at the Textile Engineering Luncheon, on Thursday.

Opening his talk with the statement, "Sometimes I wonder if the diversity of engineering specializations and talents does not lead to some confusion," he developed the theme that, as diverse and confusing as such divisions may be, added together they are an effective means for solving technological problems.

Textile engineering has contributed greatly to engineering progress. Spinning and weaving date from the remotest antiquity, and it is debatable whether the textile industry touched off the industrial revolution or whether the industrial revolution assured the development of textiles as an industry. The advent of ring spinning during the early part of the century, and the automatic loom in the 1890's were epoch-making events. The refinement and improvement of techniques have continued in our century. In spite of a 42 per cent decrease of cotton spindles from 38 million in 1925 to 22 million in 1956, there was a 47 per cent increase in cotton consumption.

The catch words, "automation," "electronics," "radiotracers," and "atomic energy," are indicative of the new potentials which will enable the engineer to increase still further the standard of living of the industry's employees and to more adequately compensate capital.

H. W. Ball, Mem. ASME and chief engineer, Foster Machine Company, Westfield, Mass., presided. A certificate was presented to him in recognition of his services as chairman of the division.

Wood Industries Luncheon

"What will be the place of forests in our future economy—in the age of metals and their alloys, and of plastics and other products of the great chemical industries?" L. J. Markwardt, assistant director, U. S. Forest Products Laboratory, Madison, Wis., speaking at the Wood Industries Luncheon on Thursday, pointed out that: "Wood, although in keen competition with other materials, has held its own in spite of their alluring claims. Forests and forest products have not only shown themselves to be essential in our modern way of life, but also serve in a greater number and variety of ways than any other product."

The timber resource report of the Forest Service has revealed that 34 per cent of our total land area in the United States and coastal Alaska, commercial and noncommercial, is in forest.

If wood were a modern synthetic material that had just been announced, he stated, you can imagine the enthusiasm with which it would be received; yet we would still have trouble producing it artificially as cheaply as it is produced by the natural process of photosynthesis, actuated by the free energy of sunlight.

He outlined the future requirements on the basis of population, and the role of forest research in forest products. There is need of much information on wood chemistry, milling practices, means of utilizing bark and saw kerf. Marketing and processing can be improved, and greater standardization of sizes and qualities is needed.

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The keys to providing the timber and forest products we need are continuous yield through forest management, and expanded research in forestry and forest-products utilization.

L. G. Brown, vice-president, Manufacturing Design, Curtis Machine Corporation, presided.

Nuclear Engineering Dinner

Speaking at the Nuclear Engineering Dinner, on Thursday, Theodore Baumeister, Mem. ASME, and Stevens Professor of Mechanical Engineering at Columbia University, stated: "Some idea of the breadth of the role of the Division in the nuclear field can be gained from an inspection of the program for the seven technical sessions of this current meeting," which are "the consequence of joint sponsorship by nine of our recognized professional divisions."

Changing to a vein of good-humored irony, he spoke of the way in which "nuclear fission is disturbing our equanimity," and referred to difficulties in terminology, materials, costs, and technology.

In alluding to those who question the practicality of nuclear power, he quoted an unnamed eminent scientist who stated, just two months before Kitty Hawk: "The mathematician of today admits that he can neither square the circle, duplicate the cube, nor trisect the angle. May not our mechanicians, in like manner, be ultimately forced to admit that aerial flight is one of the great class of problems with which man can never cope, and to give up all attempts to grapple with it?"

Francis K. McCune, Mem. ASME and vice-president and general manager, Atomic Products Division, General Electric Company, spoke of some of the problems remaining to be solved in the nuclear field, which has "already effected a major change in our civilization," and given us an increased understanding of the basic components of which all materials are made. It is "peculiarly the function of the engineer to understand and appraise this work."

Stating that he believed the solution of all of our technical problems is coming and would in turn solve our political and economic problems in this field, he urged greater participation in the nuclear program by industry. Such participation would help to convince the public that the nation "has more to gain by a continuous approach toward the freedom which surrounds other technology than it does by recession toward increased Government control."

W. E. Shoupp, Mem. ASME and assistant division manager, Atomic Power Department, of Westinghouse, was toastmaster, and presented a desk-sized nuclear reactor to B. R. Prentice in recognition of his services as chairman of the division. The reactor "goes critical" (turns red) whenever a fountain pen is removed from the holder.

Power Test Codes Dinner

Power test codes—their use by industry and how such use differs from use by utility and manufacturing companies—was the subject of a talk by Louis J. Brown, E. I. du Pont de Nemours and Company, Inc., Wilmington, Del., at the Power Test Codes Dinner on Thursday. Mr. Brown urged the development of up-to-the-minute codes in time to satisfy present-day requirements. The codes are essential to industry as guides for performance and acceptance tests of power facilities. Information from such tests serves as a basis for negotiation between the company and the customer. It was suggested that the preparation of design specifications are often too detailed for small industrial equipment. That codes be made more applicable to field-test equipment was another suggestion.

Toastmaster M. D. Engle, Fellow ASME, Pennsylvania Power and Light Company, Allentown, Pa., then introduced W. G. McLean, Mem. ASME, Lafayette College, Easton, Pa. Mr. McLean cited the outstanding work of Rawleigh M. Johnson, chairman, Power Test Codes Committee, and engineer in charge of tests, Ingersoll-Rand Company, Phillipsburg, N. J. On behalf of the Council, Mr. McLean presented a certificate acknowledging Mr. Johnson's promotion to the grade of Fellow of the Society. Mr. Johnson has been honored for his work as a test engineer and in the development of young engineers.

A. G. Christie, Hon. Mem. ASME and professor emeritus, The Johns Hopkins University, Baltimore, Md., member of the International Electrotechnical Commission appealed for codes that are mandatory, definite, and positive.

Roy V. Wright Lecture

James N. Landis, incoming president and Fellow ASME, presided at the Roy V. Wright Lecture on Tuesday afternoon. The speaker, The Honorable Joseph B. ohnson, Mem. ASME and Governor of the State of Vermont, was introduced by Frederick S. Blackall, jr., past-president and Fellow ASME.

Governor Johnson opened his address on "Engineers and Scientists in Civic, Public, and Political Life" with recollections of Dr. Wright. "I was greatly impressed," he said "by his human understanding and great interest in social and government problems as well as strictly engineering matters. So I am glad to be here to pay tribute to his memory, and to the great influence which I am sure he had upon people and events during his distinguished career." He commented on the rarity of engineers in high public office, stating that only one member of the Senate, Ralph E. Flanders of Vermont, a past-president of ASME, and one member of the House are engineers out of a total of 531; and only one other governor, George Dewey Clyde of Utah, is an engineer.

"It is a pity there cannot be more men with engineering background who can contribute their talents in top government positions in our states and nation—

Governor Johnson receives a Roy V. Wright lecture certificate from ASME Incoming-President J. N. Landis. *Left to right,* Past-President F. S. Blackall, Jr., Mrs. Roy V. Wright, Governor Johnson, President Landis.

not only in elective office, but in other high positions of great responsibility. I am sure that their background and experience give them a certain viewpoint which is too often lacking in government and which would help us avoid many of the pitfalls which trouble us in setting up major policies.

"Probably people generally do not realize what a large percentage of public business today is involved with engineering, both as regards the funds expended, and the people to carry out the projects." Governor Johnson enumerated the highway, flood control, water conservation, pollution-abatement, railroad, electric power, and telephone problems, all of which require engineers or an understanding of the engineering matters involved.

"Statistics concerning the engineering profession," he stated, "indicate that almost 80 per cent of all professional engineers are employees. This seems to preclude the opportunity for many of them to become involved in state or national elective offices until late in life. To be of most service it would be desirable that they engage in such activities in their earlier years, so as to have a longer period of service in a many-sided and complicated field. However, there should be nothing to prevent every engineer, as soon as he gets settled in a community, from taking an interest in civic affairs. He will also find it possible to take the time to accept election or appointment to local office.

"An engineer, especially if he has executive or administrative experience, can contribute greatly to the development of his community and its worth-while activities. The field is broad, but personally I believe that where we can be of greatest help at the present time is in giving our services to help guide the local school officials in the development of the kind of public school training—elementary and secondary—which seems to be called for in this day and age." He elaborated on the need for more trained scientists and engineers, in view of recent Russian scientific successes, in relation to our schools.

"I have a great deal of faith and confidence in the managerial and organizing genius, basically engineering, in this country. Our capacity to initiate and produce is unequaled, and the Soviet Sputnik does not alter this fact.

"As for any immediate threat to our national existence, we of course will have to depend on our scientists and engineers to plot the course, and I am confident that they can meet the challenge. I hope and sincerely expect that the necessary changes in course have already been charted.

"Our country, our civilization, today more than ever before, need the help of the engineer." He further stated that the tendency of professional people "to become specialists and perhaps avoid any deep feeling of responsibility for the rest of mankind beyond their narrow field" is a dangerous trend.

"It is important that we as engineers realize that we do have a civic responsibility beyond our purely technical accomplishments. The engineer, through his training and experience, has tremendous ability and capacity for doing public service. As a leading member of our society, he also has a big responsibility to serve wherever he can. In our local communities can be found fertile and challenging fields of greatly varied human interests.

"I hope that in these vitally important times we may all accept our responsibility to our utmost capacity."

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1 View of large attendance at Railroad Luncheon. 2 The ASME-EIC International Council in session during Annual Meeting. 3 At Esso Research and Engineering Center, Linden, N. J., ASME inspection group hears an explanation of the use of spectroscopic instruments in Petroleum research.

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Inspection Trips

"Research is the effort of the mind to comprehend relationships which no one has previously known and, in its finest exemplifications, it is practical as well as theoretical; trending always toward worth-while relationships, demanding common sense as well as uncommon ability . . ." These words of the late Harold De Forest Arnold, former director of research, Bell Telephone Laboratories, appear on the inscription which greeted ASME visitors to the laboratories in Murray Hill, N. J., on Thursday, December 5. Some of the finest exemplifications of research were described by members of the Bell staff who emphasized mechanical-engineering efforts which contributed to the development of apparatus for communication and military applications. Mechanical design and development of a precision tracking radar; problems of installation and accompanying storage and repair of a submarine cable system indicated the scope of the work done at the laboratories. The development of the transistor was explained. Visitors saw the metals-processing laboratory which contributes basic research on metals and studies available new materials. Outside plant department operations of the Bell System were described in a talk which outlined studies on materials and methods for the installation of cable, aerial lines, and underground electric conduit systems.

At the Esso Research and Engineering Center, Linden, N. J., visitors again viewed fine examples of research activity. A tour of the engine and test-car laboratories illustrated the exhaustive tests performed on oils, grease, and other petroleum products.

ASME visitors had the opportunity to inspect the first outdoor power plant in this part of the country. A visit to the Long Island Lighting Company's Barret Plant, Island Park, N. Y., included a look at the Hicksville engineering center, an underground distribution center, an emergency control room, and maintenance and service facilities.

College Reunions

Graduates of colleges and universities from coast to coast renewed old acquaintances with fellow alumni during the Annual Meeting on Thursday, December 5.

Alumni of the University of California met at Toots Shor's; Armand G. Erpf, manager of the investment department of Carl M. Loeb, Rhoades & Company, and a director of many large corporations, whose reputation in the field of finance and engineering is widely known, spoke to the group. The Architectural League of New York was the scene for the Carnegie Institute of Technology reunion luncheon. Vice-president of the Carnegie Institute of Technology, Russell H. Bintzer, was the speaker for the occasion. Cooper Union alumni coupled their reunion at the school's Hewitt Building with a tour of the mechanical-engineering department's laboratories. Edwin D. Harrison, Mem. ASME, and president Georgia Institute of Technology, addressed that school's alumni at their Fall dinner meeting at the Reeves Sound Studios. A cocktail party was the occasion for a reunion of Iowa State College alumni at the Engineers' Club. Michigan State University graduates also met at the Engineers' Club for a dinner. University of North Dakota graduates met at an informal luncheon. Ohio State University alumni from the college of engineering were invited to meet with Gordon B. Carson, Mem. ASME, and dean of the college at a cocktail party at the Hotel McAlpin. A dinner followed at which Dean Carson spoke on "Ferment in Engineering." Alumni of Pratt Institute gathered for dinner at Keen's English Chop House. At the Cafe Rouge in the Statler Hotel, graduates of Rensselaer Polytechnic Institute met for luncheon. The Stevens Metropolitan Club was the scene for the Stevens Institute of Technology reunion luncheon. Tufts University alumni met at the Zeta Psi Club for luncheon. Virginia Polytechnic Institute alumni met for dinner at the Fifth Avenue Hotel. Worcester Polytechnic Institute graduates met at Rosoff's restaurant. The Yale Engineering Association held its Annual "Football Smoker" at the Yale Club. Members of this year's team were present and movies covering the high lights of the season's games were shown.

Committees in Charge

ASME Meetings come under the general supervision of the Meetings Committee.

The technical program is provided by the Society's professional divisions and technical committees. Other features are planned and supervised by committees organized within the host section—in this case, the Metropolitan Section. In grateful acknowledgment, the many committees, whose efforts contributed so substantially to the success of the 1957 Annual Meeting follow:

Meetings Committee: Charles W. Parsons, *chairman;* Glenn R. Fryling, W. B. Wilkins, Arthur M. Gompf, H. M. Muller, Jr.

Annual Banquet Committee: Robert W. Cockrell, *chairman;* H. C. Wheaton, *vice-chairman*; H. H. Johnson, E. S. Bance, Arthur M. Perrin.

Plant Trips Committee: R. E. Abbott, *chairman;* J. T. Vollbrecht, *vice-chairman;* W. S. Cameron, *secretary;* J. Weiss, H. J. Melosh, R. S. Touma, K. Roe, K. Rosenbaum, D. Knight, C. Leslie, T. Cuerou, G. Nagelberg, W. Kowalsky, K. Quier, J. Preston, N. D. Birrell.

Women's Events Committee: Mrs. U. A. Rothermel (deceased), Mrs. Robert W. Worley, *honorary chairman;* Mrs. John C. Gibb, *general chairman;* Mrs. William H. Byrne, *1st vice-chairman;* Mrs. Arthur M. Perrin, *2nd vice-chairman.*

Metropolitan Section: Arthur M. Perrin, *chairman;* George B. Thom, *secretary;* Glenn R. Fryling, *treasurer.*

Board on Honors: J. Stanley Morehouse, *chairman;* Joseph B. Armitage (deceased), Harold C. R. Carlson, Frank M. Gunby, H. Drake Harkins, Eugene W. O'Brien, Lewis K. Sillcox.

Medals Committee: Frank M. Gunby, *chairman;* John R. Blizard, John W. Brennan, Wallace L. Chadwick, Alton C. Chick, Jess H. Davis, Evan A. Edwards, Crosby Field, Burnham Finney, Martin Goland, William A. Hanley, Jerome C. Hunsaker, Clarence R. Jones, Reinout P. Kroon, Justin J. McCarthy, Carl J. Oxford, Jr., Willard F. Rockwell, Carl G. A. Rosen, J. Kenneth Salisbury, George L. Sullivan, Julian B. Thomas, Theodore A. Wetzel, John C. Whitehurst.

JAMES NOBLE LANDIS

President of The American Society of Mechanical Engineers for 1958

CHARLES E. CREDE

Vice-President Region I

ARTHUR W. WEBER

Vice-President Region III

ERNEST W. ALLARDT

Vice-President Region V

New Members of 1958 ASME Council

Actions of 1957 ASME Council

The Council of The American Society of Mechanical Engineers held two sessions at the Hotel Statler, New York, N. Y., during the 1957 ASME Annual Meeting, beginning on Saturday, Nov. 30 and Sunday, Dec. 1. The following items are of general interest.

Attendance. These were present at either or both of the sessions: William F. Ryan, President, who presided; J. W. Barker, D. W. R. Morgan, E. G. Bailey, J. Calvin Brown, and F. S. Blackall, jr., past-presidents; W. H. Byrne, C. E. Crede, B. T. McMinn, F. W. Miller, A. C. Pasini, J. H. Sams, C. H. Shumaker, and R. S. Stover, vice-presidents; E. O. Bergman, F. L. Bradley, H. C. R. Carlson, G. A. Hawkins, E. W. Jacobson, R. B. Lea, Joseph Pope, and V. Weaver Smith, directors; J. N. Landis, president-elect; C. J. Eckhardt and B. G. Elliott, past vice-presidents; L. G. Smith and C. B. Campbell (Constitution and By-Laws Committee); J. Stanley Morehouse (Board on Honors); R. H. Bacon (Board on Technology); W. R. Thompson (National Junior Committee); E. J. Kates, assistant treasurer; C. E. Davies, secretary; O. B. Schier, II, deputy secretary; T. A. Marshall, Jr.; and W. E. Reaser, assistant secretaries, Ernest Hartford, consultant; J. J. Jaklitsch, Jr., editor; L. S. Dennegar, public relations director; and the following guests: E. G. Davis, R. Goetzenberger, H. Grasse, S. R. Beitler, J. C. Reed, H. H. Snelling, and E. E. Williams.

Introduction of Staff. The following members of the secretarial staff appointed during 1957 were introduced by the Secretary: William E. Reaser (assistant secretary—Field); Alan B. Conlin, Jr., assistant meetings manager; Maurice Barrangon, assistant editor; Robert J. Brins, accounting assistant. The Secretary announced that on Nov. 14, 1957, President Ryan had extended to Miss Louise Reinschmidt, member of the secretarial staff for forty years, sincere appreciation of her loyal and faithful service.

Annual Reports. The annual report of the Council was adopted, and the annual Reports of Boards, Committees, and Representatives on joint activities were received.

Woman's Auxiliary. The annual and financial reports of the Woman's Auxiliary were received with expressions of appreciation for the achievements of the year.

Constitution and By-Laws. Amendment to Par. 7, Article B8 (Officers) of the By-Laws, received for first reading on June 8, 1957, was adopted. Par. 7 relates to the duties of the Secretary. Amendments to Par. 17 and 20 of Article B6A (Boards and Committees) and Article B7 (Election of Officers) of the By-Laws were received for first reading. Article R15 of the Rules (Professional Practice) was amended to become effective when related By-Laws are adopted.

Council Policies. On recommendation of the Constitution and By-Laws Committee, new procedures for maintaining the listing of current policies were adopted and a number of actions taken by the Executive Committee of the Council were included in the list of policies.

Unification. The Council reaffirmed the action of the Executive Committee that ASME endorse in principle the AIEE Plan, outlined by M. S. Coover's letter of March 18, 1957, to President Ryan; express its willingness to explore the plan with the organizations involved; and recommend that NSPE join EJC.

Welding Research Council. A contribution from the "A" Development Fund to the Welding Research Council was authorized. Future contributions are to be a matter for discussion each year.

Group Disability Insurance. As a result of a recommendation of the 1957 Regional Delegates Conference at San Francisco, a committee was appointed to study a group disability insurance plan for ASME members. For this committee its chairman, Edgar J. Kates, reported that the proposed plan would not involve the secretarial staff, would not make the Society financially liable, and would not affect ASME tax status. Adoption of the plan would necessitate appointment of a trustee and an administrator, neither of whom would have any liability.

Hence the Council approved in principle sponsorship of Group Disability Insurance, authorized the special committee to negotiate with insurance companies on the most favorable plan, and authorized the Executive Committee of the Council to approve a suitable plan.

Relations of ASME With EIC. Relationship between ASME and The Engineering Institute of Canada is subject to further study. It is proposed to canvass the entire ASME membership to determine how best to serve Society members in Canada. Hence the Council voted to continue the committee which has had this matter

under study, to retain A. C. Pasini as a member of the committee, and to add to its personnel E. W. Allardt, Vice-President, Region V.

United Engineering Center. The Secretary reported that the Member-Giving Campaign for the new United Engineering Center will be identical in the five Founder Societies. W. F. Ryan is ASME chairman of the campaign. W. H. Byrne will solicit commerce and industry for contributions as well as ASME members in the New York area.

Accrediting Program. W. E. Reaser reported activities of the ASME Education Committee in respect to the accreditation methods of ECPD and efforts to stimulate the support of industry in the accreditation program. An Accreditation Seminar was held in Detroit, Nov. 7-8, 1957, for this purpose. Many of the participants expressed willingness to act as observers and thus become inspectors. Steps are being taken by the Education Committee to further this program.

Sections. Authorization was voted of the formation of the Gulf Coast Subsection of the Birmingham Section; of the Baytown Group of the South Texas Section; of the Texas City Area Group of the South Texas Section; of the Brazoria Subsection of the South Texas Section; and of the Calumet Subsection of the Chicago Section.

Realignment of Regions. The Council voted to divide the country into ten instead of the present eight regions. The subject is to be placed on the National Agenda for Regional Administrative Committee meetings and the Regional Delegates Conference in 1958.

Student Section Anniversaries. It was noted that Tufts University Student Section will celebrate its 40th anniversary and the Stevens Institute of Technology Student Section its 50th anniversary in 1958. Letters of congratulations are to be sent to these student sections over the signatures of the vice-presidents of the regions involved.

Regional Student Section Conferences. Permission was granted to local Sections to solicit financial aid from industry for the support of regional Student Section Conferences with the understanding that the contributors' participation shall be limited to listing of their names on the program or card suitably presented during the conference.

Certificates of Award. Certificates of award were voted to: Frederick E. Lyford (Membership Review Committee), Charles H. Coogan (Membership Development Committee), Warren R. Thompson (National Junior Committee); and to the following retiring chairmen of Sections: Francis Seyfarth (Central Illinois), William T. Alexander (Milwaukee), James E. Rudolph and Robert J. Hazelrigg (Minnesota), and Robert P. Kewley (Rocky Mountain).

Death of Mrs. Rothermel. The death of Mrs. U. A. Rothermel, president, Woman's Auxiliary, was noted, and the Secretary was asked to write a letter of condolence to Mr. Rothermel.

Scholarship Fund. It was recommended that the Woman's Auxiliary proceed with the raising of funds for educational purposes.

Actions of 1958 ASME Council

1958 ASME Council Organized. The organization of the 1958 Council of The American Society of Mechanical Engineers followed a dinner at the Statler Hotel, New York, N. Y., Dec. 2, 1957. W. F. Ryan, retiring president, called the meeting to order and introduced the new members of the Council. He then presented the President's gavel to James N. Landis, president, 1958, who took the chair.

These were present: James N. Landis, President, 1958; William F. Ryan, President, 1957; J. W. Barker, D. W. R. Morgan, E. G. Bailey, F. S. Blackall, jr., J. Calvin Brown, A. G. Christie, and E. W. O'Brien, past-presidents; E. W. Allardt, H. S. Aurand, W. H. Byrne, C. E. Crede, J. H. Sams, C. H. Shumaker, R. S. Stover, A. W. Weber, vice-presidents of the 1958 Council; B. T. McMinn and F. W. Miller, retiring vice-presidents; E. O. Bergman, H. C. R. Carlson, G. A. Hawkins, E. W. Jacobson, Louis Polk, Joseph Pope, L. N. Rowley, Jr., R. B. Smith, and G. B. Warren, directors, 1958 Council; and F. L. Bradley and R. B. Lea, retiring directors; E. J. Kates, treasurer, C. E. Davies, secretary-emeritus; O. B. Schier, II, secretary; T. A. Marshall, Jr., D. C. A. Bosworth, J. D. Wilding, and S. A. Tucker, assistant secretaries.

Tribute to W. F. Ryan. The Council extended to William F. Ryan, retiring president, its deep appreciation and sincere thanks for his achievements in office, and presented him with the President's pin.

Appointments. C. E. Davies was appointed secretary-emeritus and senior secretary to EUSEC; O. B. Schier, II, was appointed secretary; T. A. Marshall, Jr., was appointed senior assistant secretary in charge of technological services; D. C. A. Bosworth was appointed assist-

WILLIAM FRANCIS RYAN

Retiring President of The American Society of Mechanical Engineers for 1957

HENRY S. AURAND

Vice-President Region VII

RONALD B. SMITH

Director (technology)

ELMER O. BERGMAN

Director (codes and standards)

LOUIS N. ROWLEY, JR.

Director (administrative)

ant secretary and controller; William E. Reaser assistant secretary in charge of field operations; S. A. Tucker, assistant secretary and publications business manager; and John D. Wilding, assistant secretary in charge of Codes and Standards. Edgar J. Kates was appointed treasurer and Harry J. Bauer assistant treasurer. E. J. Kates was appointed treasurer of the Development Fund.

Executive Committee. The Executive Committee of the ASME Council for 1958 will consist of: J. N. Landis, chairman; E. W. Allardt, C. E. Crede, L. N. Rowley, Jr., and G. B. Warren.

Boards and Committees. The following appointments to Boards and Committees were made: Codes and Standards, E. O. Bergman and Louis Polk; Education and Professional Status, Joseph Pope; Honors, V. Weaver Smith; Public Affairs, Louis Polk; Technology, H. C. R. Carlson, E. W. Jacobson, R. B. Smith, and G. B. Warren; Finance Committee, Joseph Pope; Organization Committee, V. Weaver Smith and W. F. Ryan.

fountain-head of engineering

progress and leadership

Business Meeting

The annual Business Meeting of The American Society of Mechanical Engineers was called to order by President W. F. Ryan on Monday, Dec. 2, 1957, at the Hotel Statler, New York, N. Y.

C. E. Davies, secretary, ASME, presented the high lights of the Annual Report of the Council and of Reports of the Boards, Committees, and ASME Representatives on Joint Bodies. J. O. Amstuz, chairman of the Finance Committee, summarized the report of that Committee.

Both reports—Council and Finance—are being mailed to members this year as Section 2 of this issue of MECHANICAL ENGINEERING.

The Secretary reported for the record the names of 5002 members of various grades added to the membership since the 1956 Business Meeting, and the names of 234 deceased members.

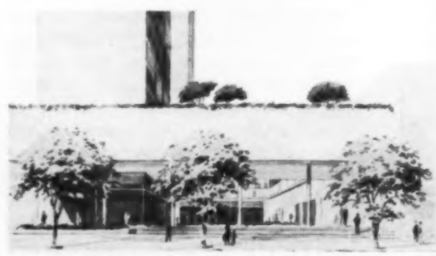
On a motion from the floor the acts and transactions of the Society and its Council during the year from Oct. 1, 1956, to Sept. 30, 1957, were approved.

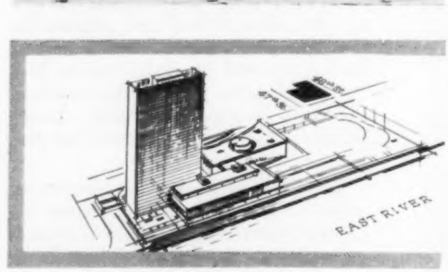
The Secretary then read the report of the Tellers for the election of officers, T. H. Lawrence, T. R. Olive, and W. H. Larkin, and the President called on each newly elected officer to stand. The officers elected are: Elmer O. Bergman, Louis N. Rowley, Jr., and Ronald B. Smith, directors; Charles E. Crede (Region I, re-elected), Arthur W. Weber (Region III), Ernst W. Allardt (Region V), and Henry S. Aurand (Region VII), Vice-Presidents; and James N. Landis, President. Biographical sketches of the newly elected officers were published in the August, 1957, issue of MECHANICAL ENGINEERING, pages 811–815.

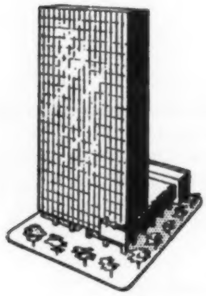
As a feature of this year's Business Meeting, a special report was presented on the new United Engineering Center.

Willis F. Thompson, Fellow ASME and ASME representative to United Engineering Trustees, Inc., briefed the members on the current status and future plans for this project. Mr. Thompson's remarks follow on pages 117 and 118 in this issue.

During the Business Meeting, Arthur Perrin, *left*, Chairman, Metropolitan Section, ASME, presents a check for $5000, an initial contribution by the Section, to W. F. Thompson, Fellow ASME and ASME representative on United Engineering Trustees, Inc., Building Committee.







New United Engineering Center

By Willis F. Thompson, Fellow ASME
ASME Representative, United Engineering Trustees, Inc. • Chairman, UET Real Estate Committee

THE United Engineering Center Building Fund Campaign was officially launched at a dinner in the Waldorf Astoria Hotel, New York, N. Y., on Nov. 21, 1957. Dr. Mervin J. Kelly, Chairman of the Industrial Campaign, electrified the group of more than 100 presidents and chairmen of the boards of America's largest businesses and industries present at the dinner by reporting a pre-kickoff total of more than $1 million.

So, we are well started on realization of the plans developed by United Engineering Trustees, Inc., for the new United Engineering Center. We are fortunate to have such men as the Honorable Herbert Hoover, Alfred P. Sloan, Jr., and John J. McCloy associated with us in the Industry Campaign. Their acceptance of positions of leadership is strong evidence of the vital importance of this undertaking. It is now up to us—the Engineering Societies and their members—to do our part.

This report is intended to review the developments that preceded Dr. Kelly's "kickoff," and to outline the task that lies ahead.

United Engineering Trustees, Inc., is composed of representatives of the Founder Engineering Societies (ASCE, AIME, ASME, AIEE, AIChE), which through UET owns and administers the present Engineering Societies Building in New York City. UET is a corporation whose charter gives it broad powers for the advancement of the engineering arts and sciences in all their branches, including the maintenance of the free public engineering library. The current and vital example of co-operation of participating Societies in the interests of the profession as a whole is the plan to erect a new United Engineering Center.

The United Engineering Center is essential if the engineering Societies are to continue to pace the tremendous growth of the engineering profession in an increasingly technological age. When the present Engineering Societies Building was dedicated in 1907, the Founder Societies' membership was about 16,000. That Building is now obsolete and inadequate. Today, the combined membership (including AIChE) is over 179,000. In addition, there are more than 66,000 members in the Associated Societies and organizations which are requesting space in the new Center. These figures do not include the more than 36,000 student members of the Societies.

Progress made during the past year in planning a new Center to serve this rapidly growing profession has been most encouraging.

Report of Special Task Committee

On Sept. 17, 1956, the Founder Societies approved the following recommendations of the Special Task Committee of United Engineering Trustees, Inc.:

"Item 1—The Engineering Societies Center be located in New York City.

"Item 2—The 39th to 40th Street site be continued in use as the site of the Engineering Societies Center.

"If rebuilding in that area proves impracticable, a comparable site should then be sought in midtown New York.

"We suggest that the Governing Boards also adopt these further recommendations for inaugurating action:

"Item 3—The United Engineering Trustees, Inc., be authorized to take proper legal action for expansion by the addition of the American Institute of Chemical Engineers to the incorporators when properly qualified.

"Item 4—The United Engineering Trustees, Inc., be authorized to raise money and accept contributions: accept the offer of the Kelly Committee; place contributions in UET Capital Fund Assets; employ architects, engineers, and attorneys; let contracts for reconstruction of the present Engineering Societies Building and/or a new building or buildings; pay all costs out of the Capital Fund Assets; and operate and maintain the new Engineering Societies Center.

"Item 5—The plans for the new and enlarged Engineering Societies Center be made with ample optimism with respect to the future growth of the five societies immediately involved. These facilities should be such as to attract and hold all of the Engineering Profession, thus fostering unity and co-operation along broad lines."

The American Institute of Chemical Engineers approved the first two recommendations noted and signified its desire to become a member body of United Engineering Trustees, Inc. Since that time, representatives of AIChE have regularly attended Board of Trustees meetings and have also served on the various Committees of UET, Inc. On July 22, 1957, the Trustees unanimously adopted a resolution to proceed with the necessary formalities to include AIChE as the fifth Founder Society.

UET Acts on Committee Report

With the approval of the recommendations of the Special Task Committee, the immediate construction problem confronting UET was to explore fully the feasibility of developing the present building site. Since Shreve, Lamb & Harmon Associates had for many years been consulting architects to UET and had an intimate and first-hand knowledge of the present building, the work of UET, Inc., and the Founder Societies, it was voted by UET that they should be employed for the preliminary work in connection with the new Engineering Center and that they should associate themselves with engineering firms approved by UET.

At the end of November, 1956, Shreve, Lamb & Harmon Associates submitted two proposals. One visualized razing the present Engineering Societies Building and erecting a new building with frontage on 40th Street, with the understanding that the necessary land could be secured from The Engineers' Club. The New York City set-back ordinances made it impossible to carry out the plan satisfactorily and necessitated its rejection.

The second proposal visualized remodeling the present Engineering Societies Building and included two stages: First, to provide 189,000 sq ft of usable space on the present site; and second, adding some 53,000 sq ft by the addition of new property on 39th Street. Estimates were obtained late in January, 1957, from two reputable construction firms on this proposal and were so high

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A report presented at the ASME Annual Business Meeting, Dec. 2, 1957, during the Annual Meeting of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Dec. 1-6, 1957.

that the use of the present site appeared impracticable.

New Site on UN Plaza Acquired

On Feb. 12, 1957, the Trustees voted to abandon plans for the site at 29 West 39th Street, after having also taken into consideration the following factors: (1) Reconstruction would require temporary relocation of occupants, thus adding costs of moving out, rent at commercial rates for a period of one and a half to two years, plus the costs of moving into the rehabilitated building; and (2) the building, as a remodeled makeshift, would not enhance the prestige of a proud profession.

Also, on February 12 a Committee representing the Trustees together with Dr. Mervin J. Kelly visited eight sites, all in midtown New York.

Unanimous and enthusiastic agreement was reached on the site including the entire block-front on the West side of United Nations Plaza (formerly First Avenue) between 47th and 48th Streets, extending West on 47th Street, 150 ft, and on 48th Street, 225 ft.

Aggressive steps were instituted to acquire this site. The property was purchased for $2,700,000.

UET has acquired the site with the exception of one 3500-sq-ft lot for which a purchase contract will permit UET to take title on July 1, 1958.

During the early part of 1957, space planning was started with the five Founder Societies and a number of contemplated Associates. Associates under consideration are:

- American Institute of Consulting Engineers
- American Institute of Industrial Engineers, Inc.
- American Rocket Society, Inc.
- American Society of Heating & Air-Conditioning Engineers, Inc.
- American Standards Association
- American Welding Society, Inc.
- Engineering Index
- Engineers' Council for Professional Development
- Engineers Joint Council
- Illuminating Engineering Society
- Society of Motion Picture & Television Engineers
- The American Society of Refrigerating Engineers
- The American Water Works Association
- The Electrochemical Society, Inc.
- The Society of Naval Architects and Marine Engineers
- Welding Research Council

Results of the studies to date would indicate that the new United Engineering Center should offer immediately almost three times the usable space in the present Engineering Societies Building.

Shreve, Lamb & Harmon Associates were appointed architects for the new Center on Aug. 12, 1957; Jaros, Baum and Holles, mechanical engineers, on Sept. 26, 1957; and Seelye, Stevenson, Value and Knecht, structural engineers, on Sept. 26, 1957.

New Building—Facts

Ready for occupancy in the fall of 1960, the building will be a 20-story tower superimposed on lower structures with landscaped surroundings. The new air-conditioned Center will not only have adequate facilities for performing present functions, but sufficient provision will be made to include continuing growth of services to the engineering profession. In addition to space requirements of the Societies, rooms for engineering meetings and committee activity will be provided.

Private dining rooms for engineers attending meetings are planned and so is a cafeteria. Enlarged library and publication facilities will be included. An exhibition space is planned in which the rapid advances in engineering will be interpreted for the general public.

In keeping with the dignity and traditions of a proud profession, an Engineering Hall of Fame is planned to perpetuate the contributions of great engineers to the effectiveness of American civilization.

It appears that we should have 188,000 sq ft of usable space in the new Center and an additional 59,000 sq ft for elevators, mechanical equipment, corridors, etc., for a total square footage of about 250,000. Until plans are firmed, bids received, and contracts executed, of course no one can positively state what the cost of the building will be. We can say, however, that we are fully confident that the cost of the building will not exceed $30 per sq ft. As mentioned previously, we have expended about $2,700,000 for the site and our joint estimate now is that the entire project will cost $10 million.

With a $10 million project to be paid for, quite obviously we are engaged in a major and vital fund-raising venture. The $10 million will be sought as follows: $2 million available from UET assets are earmarked for real-estate purposes together with the estimated proceeds from the sale of the present building and site; $3 million from members of the Societies; and $5 million from business and industry.

We, who are personally involved in Societies' activities, can be thankful for the significant achievements already made in the industrial appeal. So far as we are concerned, we wish Dr. Kelly and his associates every success in attaining the goal they have set for themselves.

That brings us to the Member Gifts Campaign.

Member Gifts Campaign

It is with great pride and pleasure to announce that Charles F. Kettering has accepted the post of Honorary Chairman of the Member Gifts Campaign and has assured us that his interest in and concern for the Engineering Societies is warm and personal. He will have associated with him the following chairmen for the Founder Societies:

- ASCE—Enoch R. Needles
- AIME—Augustus B. Kinzel
- ASME—William F. Ryan
- AIEE—Lester M. Goldsmith
- AIChE—Walter G. Whitman and S. D. Kirkpatrick

The Member Gifts Campaign will be co-ordinated and conducted simultaneously among the Societies. The Member Gifts Campaign will be conducted on both the national and local levels with the leadership of the Societies carrying responsibility for organization and solicitation.

The Member Gifts Campaign is currently being organized. First, each Society will approach selected prospects for initial gifts. This phase will be carried out by a national committee composed of prominent and active members of the Societies. Second, there will be a personal appeal to selected prospects residing in certain cities and regions throughout the country. These campaign activities will be followed by a program to secure voluntary contributions from the members not personally solicited. The campaign should be concluded by December, 1958.

Many of us will be called on to assist in some part of the campaign. It should be a privilege to serve and to accept any responsibility offered us. The success of the campaign depends on us.

It is important to remember that gifts to the campaign are deductible for income-tax purposes. It is recommended that pledges be made whereby payments can be spread over a three-year period. It is not necessary that any payment be made at the time of the pledge.

All members everywhere will be kept fully informed on the progress of the campaign through Societies' publications.

This is our campaign. The new Center is essentially needed to perform the services of our Societies. The success of the Campaign is up to us. Each of us must help.

1957 ASME Annual Meeting Papers AVAILABILITY LIST

THE papers in this list are available in separate copy form until October 1, 1958. Please order only by paper number; otherwise the order will be returned. Copies of these papers may be obtained from the ASME Order Department, 29 West 39th Street, New York 18, N. Y. Papers are priced at 25 cents each to members; 50 cents to nonmembers.

Air Pollution Controls

57—A-245 Engineering Problems in Controlling Automobile Exhaust Gases, by W. L. FAITH

57—A-270 Principles of Gas Cleaning, by R. V. KLEINSCHMIDT

Applied Mechanics

57—A-1 On the Dynamical Behavior of Rotating Shafts Driven by Universal (Hooke) Couplings, by R. M. ROSENBERG

57—A-2 Velocity and Acceleration Analysis of Plane and Space Mechanisms by Means of Independent-Position Equations, by F. H. RAVEN

57—A-3 Creep Deflections and Stresses of Beam-Columns, by T. H. LIN

57—A-4 Stress Distributions Around Hydrostatically Loaded Circular Holes in the Neighborhood of Corners, by A. J. DURELLI and A. S. KOBAYASHI

57—A-5 Carrying Capacity of an Elastic-Plastic Cylindrical Shell With Linear Strain-Hardening, by P. G. HODGE, JR., and S. V. NARDO

57—A-6 Some Basic Properties of Shoe Brakes, by G. A. G. FAZEKAS

57—A-7 Reflection of an Acoustic Step Wave From an Elastic Cylinder, by RICHARD SKALAK and M. B. FRIEDMAN

57—A-8 Bending of an Elastically Restrained Circular Plate Under Normal Loading Over a Sector, by W. A. BASSALI and R. H. DAWOUD

57—A-10 A Blade-Vibration-Damping Device—Its Testing and a Preliminary Theory of Its Operation, by R. A. DI TARANTO

57—A-11 Buckling of a Thin Annular Plate Under Uniform Compression, by N. YAMAKI

57—A-12 On the Sloshing of Liquid in a Flexible Tank, by J. W. MILES

57—A-13 Axial-Temperature-Gradient Bending Stresses in Tubes, by F. G. HAMMITT

57—A-14 Further Large Deflection Analysis for a Plate Strip Subjected to Normal Pressure and Heating, by M. L. WILLIAMS

57—A-15 The Bursting Pressure of Cylindrical and Spherical Vessels, by N. L. SVENSSON

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57—A-151 Design by Logic—Automatic Chemical Batching, by J. P. Laird

57—A-177 Temperature Distribution in Fins and Other Projections, Including Those of Building Structures, by Several Procedures, by C. F. Kayan and R. G. Gates

57—A-185 The Third Law of Thermodynamics a—Half-Century Appraisal of the Nernst Heat Theorem, by J. H. Potter

57—A-220 Innovations in Refuse-Incinerator Design, by W. Raisch

57—A-221 Product and Process Improvement Through Statistical Engineering, by C. W. Carter

Production Engineering

57—A-131 Production-Stabilization Problems in Photographic Processing, by J. M. Allderige, P. Caris, and W. H. Michie

57—A-214 Solving the Storage Problems in an Integrated Process, by D. R. Cowdrey

57—A-215 Progressive Mechanization—Economic Justification and Measurements of Actual Results, by A. J. Dunkle

57—A-240 Storage Problems Within and Surrounding an Integrated Line—Partially Automated, by C. D. Leslie

57—A-241 Pearlitic Malleable Manufacture and Use, by O. K. Hunsaker

57—A-242 Steps Taken by One Medium-Size Foundry to Meet Today's Competition, by C. H. Ker

57—A-271 Roll Forming—Chipless Production, by K. W. Stalker

Properties of Steam

57—A-190 The Acoustical Properties of Steam, by R. B. Lindsay and D. D. Eden

57—A-193 Thermal Diffusivity of Gases as Determined by the Cyclic Heat-Transfer Method, by W. B. Harrison, W. C. Boteler, and S. C. Barnett

57—A-222 Equipment for the Study of the Viscosity of Steam, by T. W. Jackson and F. A. Thomas

57—A-228 The 1957 Status of Steam Properties, by F. G. Keyes

57—A-237 An Instrument for the Measurement of the Viscosity of Steam and Compressed Water, by J. Kestin and J. R. Moszynski

57—A-266 Apparatus for the Experimental Study of the Thermodynamic Properties of Water, by H. H. Reamer, G. N. Richter, W. M. DeWitt, and B. H. Sage

Railroad

57—A-111 Testing of Railway Passenger Cars and Components, by W. W. Seary, Jr.

57—A-114 Mechanical Refrigeration in Railroad Refrigerator Cars, by B. E. Duff

57—A-130 Advancing Adhesion—Development and Test of a Chemical Formulation to Condition the Running Surface of Rail for Improved Wheel-to-Rail Adhesion, by F. G. Fisher, R. K. Allen, and G. W. Luvisi

57—A-148 Notes on the Starting of Trains, by Spyro Kyropoulos

57—A-149 Design of an 8500-Horsepower Gas Turbine-Electric Locomotive for High-Speed Freight Service, by F. D. Gowans

57—A-153 The Riding Comfort of Railroad Passenger Cars, by W. E. Burdick

57—A-232 Progress in Railway Mechanical Engineering 1956–1957, by D. R. Meier

57—A-268 Improving Rail Adhesion for Diesel Locomotives, by P. V. Garin

Rubber and Plastics

57—A-170 Designing Belts for Material Handling, by F. W. Blanchard

57—A-178 The Development of a Passenger Belt Conveyer Transportation System, by P. W. Freitag, Jr.

57—A-179 Development of Airsprings and Their Application to Automotive, Aircraft, and Industrial Uses, by H. H. Deist

57—A-208 Tensile Behavior of Reinforced Plastic Laminations and Composite Plates, by R. L. Thorkildsen

57—A-211 A High Shear-Rate Capillary Rheometer for Polymer Melts, by E. H. Merz and R. E. Colwell

57—A-212 Design and Evaluation of the Plastics House of the Future, by R. P. Whittier

57—A-213 Prediction of Creep in Bending From Tension and Compression Creep Data When Creep Coefficients are Unequal, by W. N. Findley, J. J. Poczatek, and P. N. Mathur

Safety

57—A-180 The Safe Use of Isotopes in Industry, by Wm. A. Brobst

Solar Energy Applications

57—A-260 Intermittent Absorption Cooling Systems With Solar Regeneration, by D. A. Williams, R. Chung, G. O. G. Lof, D. A. Fester, and J. A. Duffie

57—A-261 Engineering Research With a Solar Furnace, by P. E. Glaser

Textile Engineering

57—A-202 Spinning Yarns Directly From Slivers, by S. E. Patrick, Jr.

Wood Industries

57—A-16 The Automatic Lumber Planing Mill, by Peter Koch

57—A-48 Mechanization and Automation in Small Sawmills, by F. C. Simmons

57—A-150 Steel Strapping of Lumber, Veneer, and Other Wood Products, by E. P. Naumes

57—A-284 Research in Sawmilling, by W. K. Stamets, Jr., and K. C. Compton

Notes on Books Received in Engineering Societies Library

REVIEWS OF BOOKS

Industrial Management

L. P. Alford and the Evolution of Modern Industrial Management

By William J. Jaffe. The New York University Press, New York, N. Y., 1957. Cloth, $5^3/_4 \times 9^1/_4$ in., illus., appendix, index, xix and 366 pp., $5.

Reviewed by John A. Willard[1]

The author has used an interesting technique in this biography of Leon Pratt Alford. Alford's development is sketched against the background of his times and against the evolution of industrial management into what it has become today. The book portrays clearly both Alford's influence on this evolution and the effect the movement had on Alford's own growth and thinking.

Perhaps the pattern for this treatment had been set by Frederick Lewis Allen when he wrote "Only Yesterday," a book dealing with the swift flow of events—social, political, religious, and economic—in the unique postwar decade from 1920 to 1930. Mr. Jaffe's work on Alford uses a similar treatment in relating the man to his times.

Alford first exhibited an interest in industrial management back in 1910, and a couple of years later made his now famous report to The American Society of Mechanical Engineers on the subject. The next 30 years are admirably covered in the book. It gives an excellent portrayal of the progress of industrial management and, even more important, highlights Alford's increasing influence on the movement.

This reviewer developed an interest in industrial management about the same time as Mr. Alford, meeting him during that early period and coming to admire him deeply.

Mr. Jaffe leaves one with the feeling that Alford was not properly appreciated by his contemporaries and is still not appreciated today. Surely those who knew Alford will not be willing to be accused of having failed to recognize his depth of courage and fineness of mind. However, it is probably true that the modern young men who are expanding their abilities in an attempt to fill the shoes of the pioneers, scarcely recognize the debt they owe to Alford.

Mr. Jaffe has done a remarkable job of documenting the entire book with quotations and references that serve to accent the story of Alford against the backdrop of the growing management movement. The book would be worth buying for this reference material alone. To the individual who has grown up with this movement, it will provide a historical refreshing of the memory of the evolution of management. And the young man who is intent on the unfolding of his career will do well to read the book as a foundation for his knowledge of this evolution of management—a knowledge he can hardly do without.

The book is remarkably free from errors except for its indicating that former President Herbert Hoover has been a recipient of the Gantt Medal. To the best knowledge of the writer, as a past-chairman of the Gantt Medal Board, this statement is not factual.

The author in his preface, quick sketches Mr. Alford thus:

"If the study of a man's work is effectively presented, it should result in a clearer picture of his environment and a clarification of the present scene and its implications. This is especially true of a man who has spent his life in many different environments. It is even more important if he has succeeded in them all.

"This is the case with L. P. Alford.

"He was an electrical engineer, a mechanical engineer, an inventor, a shop foreman, a production superintendent, a writer on such subjects as drilling machines and bearings, management and ammunition manufacture, an engineering editor, an editor-in-chief of engineering and industrial publications, periodicals, and books, a commentator on shop procedures, a propounder of management laws and principles, a founder of a production control system that extended far beyond the production shop, one of the earliest of standardization advocates, an adherent of the examination and analysis of the costing aspects of industry, a student of industrial and human relations, a founder and furtherer of engineering and mangaement organizations, an aide to governmental committees and commissions, a diagnostician and a prognostician of the economic ills of our times, an adviser on industrial problems involved in the nation's defense, a biographer of one of the great engineers of modern times, an engineering educator, a historian of engineering's past developments, a philosopher of its present, and a prophet of its future, and the recipient of some of the highest honors American engineering can offer."

In addition to these accomplishments, packed into 40 years of active life, Alford's friends knew and appreciated his sterling character and brilliant mind.

This book, as a well-deserved tribute to Mr. Alford and a fine study of the management movement, is a worthy addition to one's library.

[1] Vice-president, Bigelow, Kent, Willard and Company, Division of H. B. Maynard and Company, Inc., New York, N. Y. Fellow ASME.

BOOKS RECEIVED IN LIBRARY

American Institute of Physics Handbook. Sponsored by the American Institute of Physics. Published 1957, by McGraw-Hill Book Company, Inc., New York, N. Y. Various pagings, $6^1/_4 \times 9^1/_2$ in., bound. $15. This volume, prepared by more than 90 specialists, is the first handbook specifically on physics to be published in America. Over a hundred subject areas are covered in the 8 sections of the book: mathematics, mechanics, heat, sound, electricity and magnetism, optics, atomic and molecular physics, and nuclear physics. Throughout the book are numerous tables, graphs, and summaries of formulas in all fields of physics.

Automation in Business and Industry.

Edited by Eugene M. Grabbe. 1957, John Wiley & Sons, Inc., New York, N. Y. 611 p., $6 \times 9^3/_8$ in., bound. $10. Based on a series of lectures given at the University of California, this book presents the fundamentals of automation, new developments and techniques, and descriptions of automation systems applications. Emphasis is placed on new developments and applications of control systems that can perform both complex control functions and data processing, as in the chapter on analog computors in industrial control systems. Components are dealt with at the beginning, and systems later. References are included.

Building an Engineering Career. By Clement C. Williams and Erich A. Farber. Third Edition, 1957. McGraw-Hill Book Company, Inc., New York, N. Y. 299 p., $6 \times 9^1/_4$ in., bound. $4.75. This is a text for an orientation course. The varied subject matter includes: Achievements in various fields of engineering; efficient study methods; and the nature of engineering thinking. An over-all view of the history of the engineering profession, from the Egyptians to twentieth-century technology, is presented together with its ethics and cultural ideas.

Collected Works of Theodore von Kármán. Published 1957 by Butterworths Scientific Publications, London, England; American Edition published by Academic Press, Inc., New York, N. Y. 4 volumes, $6^1/_2 \times 10$ in., $40. A tribute to Theodore von Kármán on his seventieth birthday, these volumes contain his works published from 1902–1952. His early papers on the buckling of columns, the theory of plastic flow, strength theories, mechanism of fluidr esistance, laminar and turbulent friction, stability of laminar flow, and theory of turbulence are all included. Because of his wide range of interests, von Kármán has contributed to applied mathematics, physics, strength of materials, stress analysis, theory of elasticity, monocoque structures, vibrations, mechanics of fluids, turbulences, aerodynamics of aircraft, and heat transfer.

Progress in Nuclear Energy. Series 8. The Economics of Nuclear Power Including Administration and Law. Edited by J. Guéron and others. 1957, McGraw-Hill Book Company, Inc., New York, N. Y. 513 p., $6 \times 9^1/_4$ in., bound. $17. This volume is the beginning of the formulation of a series of techniques for the economic evaluation of atomic power. There are five sections: A summary of the heat and electricity resources of various countries and their predicted needs for the next 50 years, which are likely to require unusual energy sources; general nuclear power economics; nuclear fuel cycles and their possibilities; reactor programs and reactor economic data; legal and administrative problems involved in the industrial utilization of atomic energy. Much of the information is from the Geneva conference.

Records and Research in Engineering and Industrial Science. By J. Edwin Holmstrom. Third Edition, 1956. Chapman & Hall Ltd., London, England. 491 p., $5^1/_2 \times 8^3/_4$ in., bound. 60s. The author's stated theme is that purposefully directed experimental research and efficiently exploited records are interdependent necessities for progress. The first part of the book describes methods of research, giving notes on relevant literature, and discusses the organization, research activities, and publications of national and international scientific institutions and societies. The remainder of the book, about a quarter of the contents, deals with types of records (reports, articles, documents, and books); bibliographical aids; and methods for acquiring, storing, and searching records. Thirty pages of bibliography are appended.

LIBRARY SERVICES

Engineering Societies Library books may be borrowed by mail by ASME Members for a small handling charge. The Library also prepares bibliographies, maintains search and photostat services, and can provide microfilm copies of any items in its collection. Address inquiries to Ralph H. Phelps, Director, Engineering Societies Library, 29 West 39th St., New York 18, N. Y.

Die Selbsttätige Regelung. By A. Leonhard. Second Edition, 1957, Springer-Verlag, Berlin, Germany. 376 p., $6^1/_4 \times 9^1/_4$ in., bound. D.M. 39. This text discusses the basic theoretical principles of automatic control as well as practical examples of its use. Following a chapter on fundamentals, analytical and graphical methods for the determination of suitable control processes are considered in detail. The stability of control is then examined. The final section is devoted to methods for the determination of appropriate control constants.

Statistical Analysis of Stationary Time Series. By Ulf Grenander and Murray Rosenblatt. 1957, John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 300 p., $5^7/_8 \times 9^1/_4$ in., bound. $11. This monograph presents a rigorous mathematical approach to time series analysis with many formal proofs as well as some practical applications such as to turbulence, random noise, and ocean waves. Chapters 1 to 3 present the basic probability theory, discuss the concepts of stationarity and the spectrum, survey the linear problems of prediction, etc., and review the earlier work in the field. Subsequent chapters deal with the new techniques using infinite dimensional models. Among the remaining topics covered are the estimation of the spectral density, asymptotic distribution of a class of estimates of the spectral distribution function, and prediction when the spectrum is not known but is estimated from the time series.

Strassenfahrzeuge mit Gasturbinenantrieb. By K. Leist and K. Graf. 1956, Westdeutscher Verlag, Köln, Germany. (Forschungsberichte des Wirtschafts- und Verkehrsministeriums Nordrhein-Westfalen, No. 242.) 69 p., $8^1/_4 \times 11^3/_4$ in., paper. DM 17.20. A previous report dealt with the projected use of small gas turbines in vehicles. In the present one the authors deal with the problems of existing designs of gas-turbine-driven motor vehicles. Following an introductory chapter on general features of gas-turbine automotive installations, there are separate chapters devoted to gas-turbine-powered trucks, buses, and passenger cars. There is a bibliography.

Symposium on Steam Quality. (Special Technical Publication No. 192). Published 1957 by the American Society for Testing Materials, Philadelphia, Pa. 49 p., 6×9 in., paper. $1.75. This publication consists of four papers dealing with the measurement and purification of steam to 0.01 ppm total dissolved solids; tracer techniques for steam purity determination; corrections to steam conductivity measurements; and the construction and operation of Larson-Lane steam purity and condensate analyzers.

The Theory of Vibrations for Engineers. By E. B. Cole. Third Edition, 1955, Macmillan Company, New York, N. Y. 362 p., $5^1/_2 \times 8^3/_4$ in., bound. $6. This volume covers various types of vibrations including natural vibrations of systems either with one degree or several degrees of freedom, damped vibrations, forced vibrations, engine vibration, transverse vibrations of beams, and self-induced vibrations. There is a chapter on practical applications of vibrations as exemplified in the earthquake recorder, fatigue testing machines, balancing machines for rotors and the Sperry gyrotron. Worked-out examples are included and new material has been added throughout.

Traité de Mécanique des Sols. By A. Caquot and J. Kerisel. 1956, Gauthiers-Villars, Paris, France. 558 p., $6^1/_2 \times 9^3/_4$ in., paper. $11.15 post paid. A comprehensive treatment of soil mechanics, beginning with a general section on the physical properties of soils, especially permeability. The second section deals with specific mechanical properties of soils: stresses and deformations; settlement; vibration phenomena; equilibrium; and shearing action in both cohesive and cohesionless soils. The third section covers engineering applications: methods for improving soil properties; pressures on retaining walls; pressure distribution under foundations and bearing capacities; and special topics such as piling, tunnels, roadway loading, and earth slopes.

VDI Berichte. Volume 9. Verbindungselemente und Verbindungen, 113 p., DM 21. Volume 12. Getriebetechnik, 194 p., DM 29.50. Volume 14. Feinwerktechnik, 101 p., DM 17.50. Published 1956 by Verein Deutscher Ingenieur Verlag, Düsseldorf, Germany. $8^1/_4 \times 11^5/_8$ in., paper. Three further collections of papers on various technical subjects as follows: Vol. 9. Fifteen papers on methods of fastening and joining metals: press fits; welding processes and welded structures; metal adhesives; screw fasteners; rivets and riveting; proper solder design for fabrication. Vol. 12. Twenty-six papers on drive mechanisms in six groups: design fundamentals; inertia forces; practical applications of plane mechanisms; practical applications of three-dimensional mechanisms; kinematics research; practical design exercises.

Vol. 14. Sixteen papers on the technology of precision mechanisms such as for office machines and motion picture equipment: size tolerances; brazed and sintered parts; drive design; application of magnet materials; etc.

Vibration Analysis Tables. By R. E. D. Bishop and D. C. Johnson. 1956, Cambridge University Press, New York, N. Y. 59 p., $8^1/_2 \times 11$ in., paper. $2. The tabulated results for beams under various conditions, shafts, and taut strings are of immediate use in vibration analysis to simplify the calculation of natural frequencies. Although no specific reference is made to damping, they will, for instance, help the engineer in finding a close approximation to the frequencies at which it would be dangerous to stimulate a system in the presence of light damping. The material has been extracted from "Mechanics of Vibration," a more comprehensive work by the same authors.

Current Engineering Events, News, and Comment

E. S. NEWMAN
News Editor

THE ROUNDUP

American Rocket Society Holds 12th Annual Meeting

Rocket engineers, affiliates of ASME, hold 1957 Meeting in the shadow of the first man-made earth satellites

THE American Rocket Society, an organization of some 7000 engineers and scientists in the nation's rocket, missile, and space-flight programs, held its annual meeting at the Hotel Statler in New York, N. Y., during the first week in December, 1957. The 27-year-old Society is an affiliate of the ASME, and its annual meeting coincided with that of the ASME, both being held in the Statler. Rocket Society attendance: 2100.

The nation's top missile scientists and engineers gathered for a program of technical papers, films, lectures, and informal get-togethers. They heard addresses by such notables as William M. Holaday, Pentagon Director of Guided Missiles, and Joseph Kaplan, chairman of the U. S. National Committee for the IGY. They saw their rocket machinery on exhibit at the New York Coliseum.

Technical Program

In the five days of the meeting there were 12 technical sessions in which 45 papers were read and discussed. Sessions were devoted to combustion, propellants, ramjets, solid rockets, liquid rockets, instrumentation, space law and sociology, human factors, space flight, guidance. One session—on liquid propellants—was "confidential," to be attended only by members of the ARS Propellants and Combustion and Liquid Rocket Divisions, who had received clearance from the Office of Naval Research.

For readers who may be wondering who makes rockets and rocket components, here are firms whose engineers presented papers: Rohm & Haas, Atlantic Research, Allegany Ballistics Laboratory, Aerojet-General, Reaction Motors, General Electric, Marquardt Aircraft, Experiment Incorporated, Applied Science Corporation, Tele-Dynamics, Inc., Federal Telecommunication Laboratories, Rocketdyne (North American Aviation), Servomechanisms, Inc., Ramo-Wooldridge, Convair Astronautics, Douglas Aircraft, Rand Corporation, Westinghouse, Sperry Gyroscope, Hallamore Electronics, Aeronutronic Systems, Inc., Lewis Flight Propulsion Laboratory, Bell Aircraft, Ford Instrument Company, Arma (American Bosch Arma).

The week-long meeting ended with an IGY Forum, in which a panel of scientists and engineers involved in the IGY discussed and answered questions on the U. S. and Russian satellites, high-altitude research rocket firings, and IGY experiments in meteorology.

New York Section

The Rocket Society's New York Section sponsored a "film night," as they did last year. Presiding at this affair was R. A. Gross, president of the New York Section, and chief research engineer of Fairchild's Engine Division. Films shown were: "A Moon Is Born," "Vanguard Films," "Road to the Stars," "Honest John," "The Corporal Story," and "Solid Propellant Rocketry."

Honors Night Dinner

More than 750 members and guests attended the Honors Night Dinner, held December 5, in the ballroom of the Statler. The outgoing President, Commander R. C. Truax, spoke briefly on the purposes of the Society, reminding his audience that interplanetary travel has always been one of their chief goals. He called for sound, long-range planning to catch up with the Russians.

Commander Truax then introduced the incoming president, G. P. Sutton, Mem. ASME, of North American Aviation, Inc., Downey, Calif. Mr. Sutton welcomed a number of guests from the audience and the dais, among whom were: SAE President W. P. Eddy; ASME President J. N. Landis; IAS President Mundy Peale; H. F. Guggenheim, president of the Harry and Florence Guggenheim Foundation; O. B. Schier, II, Secretary of the ASME; Ernest Hartford, consultant and Mem. ASME; and John A. C. Warner, secretary of SAE.

Presentation of Awards. Mr. Sutton presided over the presentation of the following awards and Fellow memberships:

The Robert H. Goddard Memorial Award, for work in liquid propellants, to Thomas F. Dixon, chief engineer of the Rocketdyne Division of North American Aviation. Mrs. Goddard, widow of the rocket pioneer, presented the award.

The G. Edward Pendray Award, for outstanding contribution to the rocket and jet propulsion literature, to Captain Grayson Merrill, USN (Ret.), of the Guided Missiles Division of Fairchild. Mr. Pendray presented the award.

The James H. Wyld Memorial Award, for outstanding application of rocket power (contributions to the Corporal and Jupiter missile programs), to William H. Pickering, director of the Jet Propulsion Laboratory, California Institute of Technology. Presented by Mrs. Wyld.

The ARS Astronautics Award, for outstanding contribution to the advancement of space flight, to Krafft A. Ehricke, of the Convair Astronautics Division of General Dynamics. Presented by A. G.

Haley, president of the International Astronautical Federation.

The ARS-Chrysler Corporation Student Award, to John Reece Roth, junior at M.I.T.; $1000 for his paper in which he presented an entirely new method of measuring the velocity of hot gases; presented by Wernher von Braun.

The C. N. Hickman Award for outstanding work in solid propellants, to Captain Levering Smith, USN, Bureau of Ordnance. Captain Smith is Technical Director of the Navy's Polaris program. Dr. Hickman presented the award.

Fellowships. Recipients of Fellow memberships were: Lieut. Col. L. F. Ayres, Air Force Ballistic Missile Division; N. S. Davis, Food Machinery & Chemical Corporation; Maj. Gen. J. B. Medaris, Army Ballistic Missile Agency; Major D. G. Simons, Air Force Missile Development Center; S. Fred Singer, University of Maryland; H. L. Thackwell, Jr., Grand Central Rocket Company; J. F. Tormey, Rocketdyne, Division of North American Aviation, Inc.

Holaday Is Main Speaker

Main speaker of the evening was William M. Holaday, Director of Guided Missiles for the Department of Defense. His speech clarified the country's position with regard to the satellite race. He stated that the United States is intent on building adequate stockpiles of missiles before it "jumps into space." We are deliberately holding back on the launching of satellites because we are giving top priority to military missiles.

This priority was necessary, Mr. Holaday said, because "right now satellites are not as militarily useful as a working, dependable missile system. Missiles are our number-one job."

The Pentagon's missile chief, a former oil company executive, said that the United States was not lagging seriously, but neither was it complacent about its rocket program. His speech was delivered a matter of hours before the failure at Cape Canaveral. Washington officials have since noted that Vanguard was a scientific, not a military rocket: Its failure cast no reflection on U. S. ballistic missiles.

The American Rocket Society has published a report entitled, "Space Flight Program," in which it recommends steps to be taken to insure responsible, unhampered development. At one point it states, "The program should not be limited by restriction to immediate military utility, but should rather seek its justification in the necessity of keeping this nation in the forefront of those who will explore the new environment about to be entered by man."


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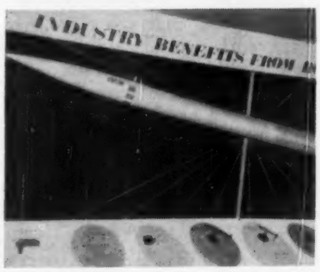

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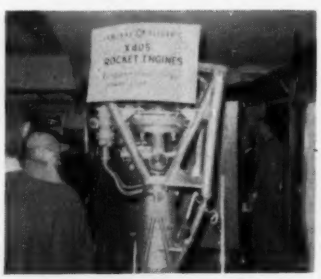
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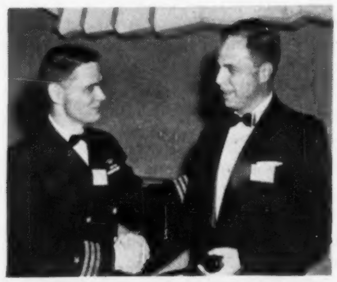
AMERICAN ROCKET SOCIETY

The Rocket Society takes the stage. 1 W. M. Holaday, Special Assistant to the Secretary of Defense for Guided Missiles, speaker at the banquet. 2, 3, 4: The rocket show – motors and other rocket components – at the New York Coliseum. Altogether, the makers of rocket materiel offered 55 exhibits presented as part of the 26th Exposition of Chemical Industries. 5 Comdr. R. C. Truax, *left,* greets his successor in the presidency of the Rocket Society, G. P. Sutton, of North American Aviation, Inc., who is also a member of the ASME. 6 Mrs. Goddard, widow of the rocket pioneer; and G. Edward Pendray, one of the founders and leaders of the Rocket Society. 7 Wernher von Braun, *left,* who developed the German V-2 in World War II, now head of the Army's Jupiter Missile Program; and Maj. Gen. J. B. Medaris, of the Army Ballistic Missile Agency.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Herbert Hoover Praises Two in Hall of Fame for Great Americans

FORMER President Herbert Hoover, Hon. Mem. ASME, led a tribute yesterday to a scientist, Josiah Willard Gibbs, and an inventor, George Westinghouse. Westinghouse was 29th president of The American Society of Mechanical Engineers. Busts of both men were installed in the Hall of Fame for Great Americans at New York University.

The 83-year-old former President linked the two men honored at NYU by observing that pure science provided raw material that engineers transformed into "better living for all mankind."

Carroll V. Newsom, the university's president, expressed hope that the event would provide new understanding of progress "when an original and creative mind is given freedom in which to work."

The bronzes were the eighty-fourth and eighty-fifth for the 630-foot open-air colonnade overlooking the Harlem River from the campus situated in upper New York City.

Men Honored

Professor Gibbs, a member of Yale University's faculty, published in 1876 mathematical laws on the transfer of heat energy between substances. Mr. Westinghouse, founder of the corporations bearing his name, invented the air brake in 1868 and demonstrated alternating electric current for lighting in 1886.

An overflow crowd of 1200 persons attended the ceremony in the auditorium of the Gould Memorial Library.

Detlev W. Bronk, Hon. Mem. ASME, president of the National Academy of Sciences, said science now was often "measured in terms of immediate practical value or international propaganda and competitive prestige."

But Professor Gibbs' "high adventure in the realm of the mind and spirit," Dr. Bronk went on, led to "vast practical uses of his physical chemistry throughout modern industry."

Mr. Hoover called the Westinghouse air brake a daily contribution to the safety of all railway travelers. Other Westinghouse inventions, he said, were providing employment for tens of thousands of families and helping housewives in millions of American homes.

Only United States citizens dead twenty-five years or more are eligible for the Hall of Fame for Great Americans in the elections held every five years by about 125 university-appointed electors.

The Gibbs bust was made by Stanley Martineau, sculptor. It was formally presented by Prof. John G. Kirkwood, director of sciences at Yale University, which with the American Chemical Society was the principal donor. The unveiling was by Professor Gibbs' nephew, Dr. Ralph G. Van Name, Yale research associate emeritus in chemistry.

The Westinghouse bust, by Edmondo Quattrocchi, was presented by William F. Ryan, ASME President, and unveiled by Walter J. Barrett, president of United Engineering Trustees, Inc., and the American Institute of Electrical Engineers, representing the major donors.

Present were three grandchildren of Mr. Westinghouse—Mrs. Agnes Simpson and Aubrey T. Westinghouse, both of Victoria, B. C., and Mrs. Margaret Kunater of Klagenfurt, Austria—and a great-grandson, George Westinghouse III, eleven years old.

The benediction was given by the Rev. Dr. Arthur Judson Brown, an elector and past executive secretary of the Presbyterian Board of Foreign Missions, who was 101 on Dec. 3, 1957.

Former President Hoover Speaks for the United Engineering Center

FORMER President Herbert Hoover, Hon. Mem. ASME, addressed more than 100 industrialists and educators assembled at New York's Waldorf-Astoria Hotel, on Nov. 21, 1957, to start the drive for funds needed by the United Engineering Trustees, Inc., to finance the new United Engineering Center. In his talk he scored our secondary schools for their failure to prepare American youngsters for training as scientists and engineers.

Mr. Hoover's words on education were altogether appropriate to an occasion intended to awaken interest and bring support to the construction of the new building. Through their common organization, the Engineers' Council for Professional Development, the Founder Societies have worked to improve the curriculums of technical colleges, and have made a start at the engineering missionary work so badly needed in our high

Former President Herbert Hoover, Hon. Mem. ASME, met 11-year-old George Westinghouse III, great-grandson of the famous inventor, Dec. 1, 1957, in front of the bust of Westinghouse, 29th President of ASME, which was unveiled at the New York University's Hall of Fame for Great Americans. Mr. Hoover delivered an address on Westinghouse who became the sixth inventor to be honored by the Hall of Fame. Founder of the Westinghouse companies, the inventor held a total of 361 patents including the Westinghouse air brake which first brought him national attention. His bust will take its place beside 84 others in an outdoor colonnade at the University.

schools. Mr. Hoover saw, in the extended work of the combined engineering societies, an angle of attack on the problem he posed.

Mr. Hoover also saw that there would have to be adequate facilities for our continuing and expanding activities—activities so vital to the country's security and progress. We reprint, here, the opening passages of his speech:

"This meeting has been called for the promotion of new and adequate national headquarters for the engineering profession and for discussion of some of our national engineering problems.

"Today marks the launching of a drive by the United Engineering Societies for the funds to erect a new building. We need the support of all our members. And especially do we need support from industry.

"The activities of these societies are of vital importance to the American people, to the engineers, and to the industries.

"We have about 200,000 engineer members in these societies and the membership is constantly increasing. We are overcrowded in our present headquarters. It has become clear that we must have more room if we are to conduct effectively what has become one of the nation's greatest educational centers.

"Our library—the greatest engineering library in the country—is overflowing. Our present building is inadquate to provide for the great meetings of our members. At these meetings new steps of progress in engineering are presented to the world and the road to further advance over new frontiers is illuminated."

Start of New Building Urged. "Our present building has insufficient quarters for housing, food facilities, and for social gatherings of the profession. From these personal associations spring many new and useful ideas for service to the American people. We have a site. We urgently need to start our new building."

High Lights of the ECPD-EJC Joint Assembly and the Twenty-Fifth Annual Meeting of ECPD

THE Joint Assembly of Engineers' Council for Professional Development and Engineers Joint Council was held Oct. 24-25, 1957, in the Hotel Statler, New York, N. Y. Four panel sessions on the subjects of the attitude survey, the community college and technological education, the place of the engineer in management, and new dimensions in postgraduate education for the young engineer were held during the two days with two luncheon meetings and the Silver Anniversary Dinner commemorating the 25th Anniversary of ECPD. Meetings of the Council and ECPD committees were held in parallel with the sessions.

The 25th Annual Meeting of ECPD was called together by president M. D. Hooven, who outlined the joint program, stating that there were representations from many societies and disciplines which required a certain amount of cooperation. The president's report brought out the support and help received from voluntary individual services, not necessarily encompassed within the eight bodies of the formal organization.

Thorndike Saville, a past-president of ECPD, as well as of EJC, commented on how well the two organizations work together by defining areas with less overlapping of interests and regional collaboration.

Silver Anniversary Dinner

The feature of the meeting was an address by ASME Secretary, Clarence E. Davies, the first secretary of ECPD and of EJC. (See pages 42-43 of this issue.)

President M. D. Hooven was toastmaster and drew attention to the broad representation from every society in the United States and Canada, which represented over a half million engineers.

Luncheon Meetings

The high light of the first luncheon held October 24 was a report of the Third EUSEC Conference on Engineering Education and Training by Thorndike Saville, chairman of the U. S. delegation to the conference. The speaker explained the scope of the report, the procedures followed, and the surmounting of difficulties when drawing comparisons between twelve countries with different languages, terminology, and educational systems.

In respect to the criteria for professional recognition, Thorndike Saville explained that in most European countries graduates of universities are recognized by law. In Great Britain, recognition is by charter membership in one of the three professional institutions. Recognition in other countries is by title, Diploma Engineer; whereas in the United States recognition is by license. The delegation headed by Thorndike Saville, with H. H. Armsby, M. M. Boring, and H. L. Hazen, represented for the first time a concentrated direct drive to present the U. S. attitude toward engineering education. The Third EUSEC Conference on Engineering Education and Training made a great contribution to education internationally and for better world understanding.

After the presentation of the report, O. B. Schier, II, deputy secretary, ASME, who attended the EUSEC Conference as an observer, stated that it was inspiring to see the reactions which the U. S. A. delegation who attended the conference had brought about. France was complimented on having made excellent arrangements with a good translation service, and the reception time was well spent.

Colonel L. F. Grant, past-president, ECPD, who acted as toastmaster, concluded with the remark that publication of the report by the British will be of great benefit to all engineering education.

The feature of the second luncheon held on October 25 was an address, "The Role of the Engineering Colleges in Professional and Engineering Development," by Dana Young of Yale University. The speaker highlighted the swiftly changing trends in engineering education and their effects upon industry. The greater emphasis on basic theory and less on engineering know-how will require industries to provide the advanced specialized training. The trend of introduction of the social sciences in the engineering curricula will grow and widen the gap between technical knowledge and the more liberalized form of education. The speaker pointed out that there is an increase in the number taking graduate work, and that major emphasis will be on basic theory and research. Industry must provide advanced training in three rapidly expanding fields, and the engineering profession must recognize that education is a lifetime job.

In the absence of J. W. Barker, president of EJC, the immediate past-president, T. H. Chilton, acted as toastmaster and introduced the speaker.

The Attitude Survey

Four papers were presented in a panel on the attitude survey with Hugh L. Dryden, director, National Advisory Committee for Aeronautics, presiding.

The first paper presented the results of a survey of the attitudes and motivations of scientists and engineers toward their jobs in government and industry conducted by the White House Committee on Scientists and Engineers for Federal Government Programs. Albert F. Siepert explained that there were 17,439 respondents from government agencies and 3317 respondents from private laboratories. Attitudes of government employees were similar on most points. Government pay scales and prospect for salary advancement were behind industry's, but fringe benefits were better.

Winston Oberg, associate professor in management at Michigan State University, and formerly a personnel assistant at Esso, dealt with an action program for industry as a result of the findings from the White House Committee survey. Professor Oberg informally polled five companies participating in the survey and summarized the results: (a) The survey was worth while; (b) it did give most company management some surprises; (c) the survey has not yet been completely digested and acted on.

The third paper presented by Joseph Colmen, a psychologist and chief of the Personnel Research Branch, Headquarters, U. S. Air Force, reported an action program for the government. In respect to salaries, the government would take proper action through legislation to provide greater flexibility and better starting salaries for graduates as well as higher pay for those in the $12,000 bracket and above. In respect to supervision and management, the National Bureau of Standards has set up advisory committees. The Air Force is conducting training on how to communicate, and special cash and honorary awards will be provided.

C. Wilson Randle, partner and director of Management Research, Booz, Allen & Hamilton, dealt with the question as to whether the word really gets through. In a survey of some 500 research and laboratory employees, the speaker pointed out that management must be aware of problems in the laboratory and their order of magnitude as well as the need for good two-way communication between management and laboratory people.

The Community College and Technological Education

A panel of three speakers with J. W. Parker, past-president of ECPD, presiding, presented various aspects of the community college and technological education. In opening the session, the chairman stated that in the short supply of engineering manpower, demand will make itself felt and enough men ultimately will be found by natural processes.

Dr. E. K. Fretwell, Jr., assistant commissioner for Higher Education in the State of New York, outlined the advantages of the two-year types of community colleges. He stated that some 16 per cent more high-school graduates would attend the two-year programs if facilities were available, and some 73,000 spaces would be required for the program.

Otto Klitgord, president, New York City Community College, Brooklyn, N. Y., outlined the programs and objectives of the two-year community college in the education of technicians who assist engineers, pre-engineers, and engineers. He believed that the faculties of two-year colleges should refer individuals having abilities enabling them to succeed as engineers to the engineering colleges as soon as their abilities are detected. Conversely, the engineering colleges should assist those who do not succeed in their curriculums to seek transfer into a technical terminal program.

G. Ross Henninger, associate director, Engineering Extension, Iowa State College, and director of the National Survey of Technical Institute Education of the ASEE, laid down some carefully considered definitions for the engineering technician. He referred to the engineering manpower team as a three-part team made up of the engineer, the engineering technician, and the craftsman, each contributing in proportion to the task to be undertaken. To produce an efficient three-part team requires a three-part educational program: (a) University collegiate program for engineers and scientists; (b) technical-institute types of engineering programs for engineering technicians; and (c) vocational trade programs for the craftsman. The technical institute accrediting program of ECPD was considered to be the most effective and hence the most desirable educational program for engineering technicians. Collectively, the 635 community colleges, established and operating across the country, are in a position of strategic importance and potential with respect to the expanding need for educational capacity in the semiprofessional zones of engineering and other technologies.

Engineer's Place in Management

Four papers were presented in a panel representing a cross section of industry. Two of the speakers were from small industrial organizations and two from large organizations.

The place of the engineer in industrial management was presented by Frank W. Miller, president and director, Yarnall-

Head table at EJC-ECPD General Assembly Banquet. *Left to right,* G. H. Dyer, president, NSPE; G. B. Carson, president, AIIE; L. F. Grant, past-president, EIC; P. B. Gordon, president, ASHAE; J. H. Rushton, president, AIChE; W. J. Barrett, president, AIEE; and A. B. Kinzel, president-elect AIME.

Head table continued, *left to right,* ASME President W. F. Ryan; F. C. Lindeval, president, ASEE; F. Merryfield, president, AWWA; R. C. Warner, representing NSBEE; H. F. Spoehrer, president, ASRE; and E. H. Anson, president, AICE

Waring Company. With respect to the qualifications of engineers to fill management positions, the speaker canvassed ten small industrial companies, and found that 60 to 80 per cent of the executive and managerial positions were filled by engineers. The areas in which engineers should add to their knowledge to become effective managers were outlined as well as places where the training and experience could be acquired.

William E. Mullestein, vice-president of the Lukens Steel Company, described the on-the-job training of engineers in industrial management in the world's largest steel-plate company. The engineer with education, experience, and leadership qualifications is sought out for the management team. Movement over a two-year period from department to department is a matter of work assignment. Lukens also pays a young engineer's tuition, upon satisfactory completion of the assigned work, at night school or for correspondence courses.

Harry Krieger, Jr., administrator, Engineering Personnel Relations, RCA, outlined management selection and development programs in a large organization, which consisted of a program for first-level supervisors of engineers, middle management, and advanced management.

R. G. Ernest, head of the Technical Department, Bayonne Refinery, Esso Standard Oil Company, stressed the importance of the management climate and the basic management principles. Management climate involves a recognition that human assets are far more important than raw material reserves, new equipment, or financial strength. Six basic principles of management were outlined: Delegation of responsibility, assuming responsibility, facing up to problems, challenging jobs, high standards of performance, and the encouragement of personal initiative.

The session on the place of the engineer in management was chairmanned by Harold E. Smiddy, vice-president, General Electric Company, New York, N. Y.

New Dimensions in Postgraduate Education

New trends in combining advanced engineering education with engineering employment were brought out in a panel with Ernst Weber, acting president, Polytechnic Institute of Brooklyn, presiding.

Dean Paul Hemke of Rensselaer Polytechnic Institute described a unique off-the-campus center established in the vicinity of Hartford where graduate programs for full-time employees lead to a master's degree, with majors in science and engineering. The building and land were given outright and the United Aircraft Corporation underwrites the operational budget for a five-year period. The employee-student pays $20 per credit hour at registration, one half of which is refunded upon satisfactory completion of the course, and the remainder is returned upon completion of the degree program.

S. B. Ingram, director of Education and Training, Bell Telephone Laboratories, Inc., described the integration of the communications-development training program with the College of Engineering of New York University to obtain the graduate degree. Faculty is provided by the university, and the curriculums prescribed by them, but the work is done on company time. All new college-graduate recruits to the technical staff at the B.S. and M.S. level participate. Other courses may be taken under a tuition-refund plan, outside of working hours. Graduate study at the New York University Center is only one of three phases of the communications-development training program. Special technical courses are taught by the Bell System which carry no graduate credit.

R. W. Rawson, chief engineer of the Fansteel Metallurgical Corporation, outlined their co-operative program with Northwestern University and the Illinois Institute of Technology. Fansteel also has a postgraduate program including a curriculum in Lake Forest College known as the Industrial Management Institute, and supervisors have been sent to Harvard Business School and the University of Chicago for special training in management.

Fred L. Martinson, chief engineer, Electronics Associates, Inc., outlined a broad company policy to reimburse the employee for all tuition and fees for completed courses relating to his field. The clause, "relating to his field," is liberally interpreted. Arrangements for undergraduate work are with Monmouth College, and graduate students usually attend Rutgers University, Newark College of Engineering, or one of the other graduate schools in the New York metropolitan area. Additional education may be obtained on a full-time basis with a leave of absence. Provision then is made for continuation of fringe benefits and seniority after the return of the employee.

Another view of head table at the EJC-ECPD General Assembly Banquet shows, *left to right*, T. H. Chilton, past-president, EJC; C. E. Davies, secretary, ASME, principal speaker; M. D. Hooven, past-president, ECPD; L. R. Howson, president, ASCE; and ASME President W. F. Ryan

MEETINGS OF OTHER SOCIETIES

Jan. 25–29

American Society of Heating and Air-Conditioning Engineers, annual meeting, Penn-Sheraton Hotel, Pittsburgh, Pa.

Jan. 27–30

Plant Maintenance and Engineering Conference, International Amphitheater, Chicago, Ill.

Jan. 28–31

Society of Plastics Engineers, Inc., annual technical conference, Sheraton-Cadillac Hotel, Detroit, Mich.

Jan. 30–31

American Society for Engineering Education, University of Illinois, Urbana, Ill.

Feb. 4–6

Society of the Plastics Industry, Inc., reinforced plastics division conference, Edgewater Beach Hotel, Chicago, Ill.

Feb. 13–15

National Society of Professional Engineers, spring meeting, Michigan State University, East Lansing, Mich.

(*ASME Coming Events, see page 134.*)

Notes on Society Activities and Events

E. S. NEWMAN
News Editor

THE ASME NEWS

ASME Gas Turbine Power Conference and Exhibit, Shoreham Hotel, Washington, D. C., March 3–6

Outstanding papers, exhibits scheduled for International Gas Turbine Power Conference

WITH an outstanding series of papers and exhibits planned, the third annual conference of the Gas Turbine Power Division of The American Society of Mechanical Engineers will be held March 3–6, 1958, at the Shoreham Hotel, Washington, D. C.

More than 900 gas-turbine experts from across the nation and other countries are expected to attend the conference covering gas turbines for industrial and marine application. Meetings will be held each morning Monday through Thursday, each afternoon with the exception of Wednesday, when a special field trip will be arranged, and Monday and Tuesday evenings.

The annual banquet will be held Wednesday night, with an outstanding speaker being engaged for this high light.

Exhibitors

The following firms are definitely committed to show thus far. Austenal, Inc.; Bendix Aviation Corporation; Boeing Airplane Company; Brown Boveri Corporation; Burgess-Manning Company; Clark Bros. Company; Cleveland Diesel Engine Division, GMC; Cleveland Graphite Bronze Company; Fabricast Division, GMC; The Franklin Institute; Formsprag Company; Garrett Corporation; General Electric Company; Haynes Stellite Company; International Nickel Company; Lucas-Rotax, Ltd.

Also, Lycoming Division, Avco Manufacturing Corporation; North American Aviation Company; Wm. W. Nugent & Company, Inc.; *Oil, Engine & Gas Turbine;* Solar Aircraft Company; Thompson Products, Inc.; Westinghouse Corporation; Woodward Governor Company; *Diesel and Gas Turbine Progress.*

All exhibits are limited to various types of gas-turbine power plants, component parts, materials, including fuels and all accessories.

Technical Program

The tentative technical program follows:

MONDAY, MARCH 3

9:30 a.m.

Session 1

Design and Operation of Intermediate Gas Turbine Pumping Units of Trans-Arabian Pipe Line Company,[1] by *P. P. Nibley*, Trans-Arabian Pipe Line Co., New York, N. Y.

Operating Experiences of General Electric Gas Turbines,[1] by *H. D. McLean*, General Electric Co., Schenectady, N. Y.

A W-121 Gas-Turbine Frame for Power Generation and Mechanical Drive,[1] by *R. E. Strong*, Westinghouse Electric Corp., Philadelphia, Pa.

2:00 p.m.

Session 2

Operation Experience With 750/1000-Kw Gas Turbine,[1] by *G. B. R. Feilden*, Ruston & Hornsby, Ltd., Lincoln, England

Economic Considerations in Applying Gas Turbines to Electric Utility and Industrial Applications,[1] by *C. R. Dygert*, General Electric Co., Schenectady, N. Y.

Present State and Future Outlook of the Free-Piston Engine,[1] by *R. Huber*, Société d'Études, Mécaniques et Énergetiques, Rueil-Malmaison, France

8:00 p.m.

Session 3

Small Scale Burner Tests to Investigate Oil-Ash Corrosion,[1] by *R. C. Amero, A. G. Rocchini*, and *G. E. Trautman*, Gulf Research and Development Co., Pittsburgh, Pa.

The Experiences in the Last Several Years With Burning Heavy Fuel Having Principally to Do With Deposit Under Continuous Operation as Compared with Intermittent Operation and Including Some 2000 or 3000 Hours of Operation With 360-PPM Vanadium Fuel,[1] by *B. O. Buckland* and *Alan Foster*, General Electric Co., Schenectady, N. Y.

TUESDAY, MARCH 4

9:30 a.m.

Session 4

The Use of Adjustable Stator Blades to Reduce Idle Fuel Flow,[1] by *C. Howard* and *R. L. Hendrickson*, General Electric Co., Schenectady, N. Y.

The Comprex—A New Concept of Diesel Supercharger,[1] by *F. J. Gardiner* and *Max Berchtold*, I-T-E Circuit Breaker Co., Philadelphia, Pa.

Valveless Wave-Type Gas-Turbine Combustors, by *Carroll D. Porter*

2:00 p.m.

Session 5

Rearrangement of the Temperature Field in Flow Around a Bend,[1] by *T. F. Irvine, Jr.*, University of Minnesota

The Performance and Reliability of Aero-Gas-Turbine Combustion Chambers,[1] by *J. S. Clarke*, Joseph Lucas, Ltd., Birmingham, England

Plate-Type Air Preheaters for Automotive Gas Turbines With Special Reference to Their Optimization as Regards Weight as Well as Gas Turbine and Vehicle Performance,[1] by *W. Hryniszak*, C. A. Parsons & Co., Ltd., Newcastle-on-Tyne, England

8:00 p.m.

Session 6

The New Gas Turbine for Steel Industry,[1] by *Z. S. Stys*, Brown Boveri Corp., New York, N. Y.

Gas Turbines for Blast Furnace Blowing,[1] by *J. O. Stephens*, Westinghouse Electric Corp., Philadelphia, Pa., and *George Krapf*, United States Steel

WEDNESDAY, MARCH 5

9:30 a.m.

[1] Paper not available—see box on this page.

Orders for Technical Papers

COPIES of papers are not available because review of manuscripts had not been completed when program went to press. The author's name and paper number will appear with paper title in final program (available only at conference) as well as the issue of MECHANICAL ENGINEERING containing an account of the conference.

When copies of numbered ASME papers become available, they may be obtained by writing ASME Order Department, 29 West 39th Street, New York 18, N. Y. Copies will be available until Jan. 2, 1959. Papers priced at 25 cents each to members and 50 cents each to nonmembers.

Session 7

Slipper Bearings and Vibration Control in Small Gas Turbines,[1] by *H. C. Hill,* Boeing Airplane Co., Seattle, Wash.

2500-Hr Accelerated File Test of a Pair of 160-Hp Open-Cycle Gas Turbines,[1] by *Charles Miller,* Gas Turbine Section Bureau of Ships, and *S. E. Fisher,* Gas Turbine Branch

Stage Performance and Radial Matching of Axial-Compressor Blade Rows,[1] by *Jeffrey Watkins,* Solar Aircraft Co., San Diego, Calif.

Design Analysis of the General Electric T58 Engine,[1] by *F. W. Heglung,* General Electric Co., West Lynn, Mass.

THURSDAY, MARCH 6

9:30 a.m.

Session 8

Controlling a Marine Gas Turbine,[1] by *F. H. Van Nest,* General Electric Co., Schenectady, N. Y.

The "Auris" New Gas-Turbine Project,[1] by *John Lamb,* The Shell Petroleum Co., Ltd., London, England

Design Features of a New 13,400-Hp Single-Shaft Gas Turbine,[1] by *A. N. Smith,* General Electric Co., Schenectady, N. Y.

2:00 p.m.

Session 9

The Use of High-Temperature Alloys in the Gas-Turbine Field,[1] by *G. A. Fritzlen,* Haynes Stellite Co., New York, N. Y.

Nuclear Reactors as an Energy Source for Gas Turbines,[1] by *L. H. Roddis, Jr.,* U. S. AEC, Washington, D. C.

Steam-Turbine and Gas-Turbine Cycles for High-Temperature Gas-Cooled Reactors,[1] Part 1, **The Heat-Power Cycle,** by *P. F. Martinuzzi,* Stevens Institute of Technology, and *Ted Jarvis,* Ford Instrument Co., Long Island City, N. Y.

AIEE Joins ASME Sixth Annual Engineering Management Conference

Well-integrated program planned for March 19-20 at Hotel Somerset, Boston

A FIRST-HAND demonstration of "Management in Action" will be offered to participants in the sixth annual Management Conference to be held at the Hotel Somerset in Boston, Mass., March 19 and 20. The meeting, jointly sponsored by The American Society of Mechanical Engineers and the American Institute of Electrical Engineers, will integrate lectures and field trips in order that attendees may hear of the latest management techniques and see them in action.

Three organizations are participating in the Management in Action program. They are: Arthur D. Little, Inc., the Stone & Webster Engineering Corporation, and the Massachusetts Institute of Technology.

On the morning of March 20, Lawrence W. Bass, vice-president of Arthur D. Little Company, will speak on the "Evaluation of Research Projects," Howard W. Johnson of M.I.T. will talk about "The Development of Engineering Personnel for Management Responsibility," and J. J. Niland of the engineering management staff of Stone & Webster will discuss "Planning and Control of Integrated Design and Construction Projects."

In the afternoon, listeners may go either to the Little Company to explore the management of a research project, to Stone & Webster to observe the construction of the third unit of the Salem Harbor power station, or to M.I.T. to see the training of Sloan Fellows and review the management of human resources. All who participate in these tours will have opportunities to speak with organization personnel

The integrated lecture tours will follow a day of speeches on long-range planning, finance, technical effort in long and short-term programs, and planning in the face of rapid obsolescence.

The tentative program follows:

TUESDAY, MARCH 18

5:00–7:00 p.m.
Early Bird Social Hour

6:30–9:00 p.m.
Premeeting Registration

WEDNESDAY, MARCH 19

9:00 a.m. Registration

10:00 a.m.

Session 1—Planning Ahead and Measuring Progress

Welcome: *G. R. Northrup,* engineering supervisor, Philco Corp., Philadelphia, Pa.

Keynote Speaker: *R. F. Dauer,* plant manager, Home Heating and Cooling Department, General Electric Co., Trenton, N. J.

Chairman: *George Muschamp,* vice-president, engineering, Brown Instrument Division, Minneapolis-Honeywell Reg. Co., Philadelphia, Pa.

Vice-Chairman: *John T. Blake,* plant manager, Simplex Wire & Cable Co., Boston, Mass.

Company-Wide Aspects of Long-Range Planning,[1] by *H. B. Maynard,* H. B. Maynard and Company, Inc., Pittsburgh, Pa.

Competitive Position as a Yardstick of Engineering Progress,[1] by *O. E. Rodgers,* Utica-Bend Corp., Utica, Mich.

12:15 p.m. Luncheon

Presiding: *W. T. Alexander,* dean of engineering, Northeastern University

Speaker: *L. E. Newman,* president, A. L. Smith Iron Works, Chelsea, Mass.

Subject: **Some Philosophies of Management**

2:15 p.m.

Session 2—Developing the Theory

Chairman: *H. B. Kiputh,* manager of personnel, Bettis Atomic Power Division, Westinghouse Electric Corp., Pittsburgh, Pa.

Vice-Chairman: *Robert G. Hess,* executive vice-president, Walworth Co., New York

Financing for the Future,[1] by *Ralph Kelmon,* assistant to the treasurer, Boston Edison Co., Boston, Mass.

Integrating Technical Effort in Long and Short-Term Programs,[1] by *G. R. Northrup,* Philco Corp., Philadelphia, Pa.

Planning Facilities in the Face of Rapid Obsolescence,[1] by *S. W. Herwald,* Westinghouse Electric Corp., Baltimore, Md.

6:00 p.m. Social Hour

7:00 p.m. Banquet

Toastmaster: *Charles E. Crede,* vice-president, Barry Corp., Watertown, Mass.

Introduction of Speaker: *Erwin H. Schell,* professor emeritus and lecturer, M.I.T.

Speaker: *A. M. Lederer,* chairman of Council for International Progress in Management (U.S.A.) Inc., Morris and Van Wormer, New York

Subject: **International Engineering Management**

Fellowship Award Presentation

THURSDAY, MARCH 20

9:00 a.m.

Session 3—Blueprint for Action

Chairman: *George J. Crowdes,* chief engineer, Simplex Wire & Cable Co., Boston, Mass.

Vice-Chairman: *C. G. Parker,* New England Gas & Electric Co., Boston, Mass.

Evaluation of Research Programs,[1] by *L. W. Bass,* Arthur D. Little, Inc., Cambridge, Mass.

The Development of Engineering Personnel for Managerial Responsibility,[1] by *Howard W. Johnson,* M.I.T.

[1] Paper not available—see box on page 132.

The main dome and great court of Massachusetts Institute of Technology. A Management in Action session of the ASME-AIEE Management Conference will be held here, March 20.

The Convair B-58 in flight. One of the many aircraft manufactured in the Dallas-Fort Worth area. North Texas Section, ASME, will be host to the 1958 ASME-ARS Aviation Conference, March 17–20, Statler-Hilton Hotel, Dallas, Texas.

Planning and Control of Integrated Design and Construction Projects,[1] by *J. J. Niland*, Stone & Webster Engineering Corp., Boston, Mass.

12:15 p.m. Buffet Luncheon

Orientation for "Management In Action" Visits, by *Walter L. Abel*, chairman of Plant Visits Committee; assistant director of research, United Shoe Machinery Corp.

1:45 p.m. Inspection Trips

Patent and Invention Management; products resulting from effective patent management will be viewed (Management In Action), by *Alfred R. Johnson*

"Management In Action"; history, current status, and future plans of an important research project involving two large corporations and a South American country, by *Bruce S. Old*

New Developments in the Use of Computers in Engineering, by *George E. Kimball*

Tour of Arthur D. Little's Computer Facilities

Objectives of the Management School, by *E. P. Brooks*

The M.I.T. Executive Development Program, by *Howard Wesley Johnson*

Two groups will be formed: Group 1 will observe M.A. training involving the Sloan Fellows through one-way glass windows

Group 2 will review with Douglas V. Brown, "The Management of Human Resources"

Groups 1 and 2 will exchange leaders and cover the same subjects

Assembly of whole group for coffee and discussion with members of the faculty and the Sloan Fellows.

Welcoming Address: *F. W. Argue*, vice-president, member of the Board of Directors, and engineering manager, Stone & Webster Engineering Corp., Boston, Mass.

Construction of the third unit of the Salem Harbor power station of the New England Power Co., client of Stone & Webster Engrg. Corp., will be observed by small guided groups. This will be a semifinished product of the efforts described in the morning's talk by J. J. Niland; "Planning and Control of Integrated Design and Construction Projects" (Management In Action)

ASME Materials Handling Conference, First Since 1949, Is Announced

To be held June 9 to 12, 1958, in Cleveland, with National Materials Handling Exposition

A NATIONAL conference on materials handling, the first to be sponsored by The American Society of Mechanical Engineers since 1949, was announced by John C. Somers, chairman of the Society's Materials Handling Division and president of Industrial Products Engineering Company, Long Island City, N. Y.

The conference will be held in conjunction with the National Materials Handling Exposition, produced by Clapp & Poliak, Inc., of New York, exposition management firm, at the Public Auditorium, Cleveland, Ohio, June 9 to 12, 1958.

This move is in accordance with the Society's policy of encouraging its professional divisions to sponsor separate national conferences devoted to serving mechanical engineers in the specialties of their particular fields.

Describing materials handling as the "backbone of automation," Mr. Somers declared "the need for a new appraisal of this fast-growing engineering science is an imperative one." He predicted the conference would be one of the best attended engineering meetings of the year. "Few engineering problems which face management today are as important as materials handling," Mr. Somers said. "Only ten years ago it was virtually unknown as an important factor and some of the practices and equipment, adopted became outmoded almost as soon as installed. The need for a new appraisal of this fast-growing engineering science is an imperative one and we believe the ASME can provide the leadership for bringing about some balance in this field.

"Despite a decade of constant effort, materials handling remains one of the few places where substantial cost reduction can be effected. Materials handling is the backbone of automation. Progress toward the goal of the automatic factory will be slow unless a true science of moving materials is developed. This means reliance, not on one type of equipment, but on a system which uses the most appropriate equipment for the specific need.

"The National Materials Handling Exposition will have one of the largest and most varied displays ever gathered of materials-handling equipment. We have chosen to hold this conference concurrently with the show because these exhibits will provide an important practical background to the scientific discussions," Mr. Somers said.

ASME COMING EVENTS

March 2–6

ASME Gas Turbine Power Conference and Exhibit, Shoreham Hotel, Washington, D. C.

March 16–22

Nuclear Congress, International Amphitheater, Chicago, Ill. (ASME is cosponsor)

March 17–20

ASME-ARS Joint Aviation Conference, Hotel Statler-Hilton, Dallas, Texas

March 19–20

ASME-AIEE Engineering Management Conference, Somerset Hotel, Boston, Mass.

March 20–21

ASME Textile Engineering Conference, North Carolina State College, Raleigh, N. C.

March 30–April 1

ASME Wood Industries Conference, Syracuse University, Syracuse, N. Y.

April 1–3

ASME Instruments and Regulators Conference, University of Delaware, Newark, Del.

April 9–10

ASME Railroad Conference, Hotel Statler, Cleveland, Ohio

April 14–15

ASME Plant Maintenance and Engineering Conference, Penn-Sheraton Hotel, Pittsburgh, Pa.

April 14–17

ASME Design Engineering Conference, International Amphitheater, Chicago, Ill.

April 15–17

ASME-AWS Metals Engineering Joint Conference, Hotel Statler, St. Louis, Mo.

April 24–25

ASME Management-SAM Conference, Hotel Statler, New York, N. Y.

May 18–22

ASME Oil and Gas Power Conference and Exhibit, Bellevue-Stratford Hotel, Philadelphia, Pa.

June 11–14

Third U. S. Congress of Theoretical and Applied Mechanics, Brown University, Providence, R. I. (ASME is cosponsor.)

June 15–19

ASME Semi-Annual Meeting, Hotel Statler, Detroit, Mich.

Aug. 18–21

ASME-AIChE Heat Transfer Conference, Northwestern University, Evanston, Ill.

Note: Members wishing to prepare a paper for presentation at ASME national meetings or divisional conferences should secure a copy of Manual MS-4, "An ASME Paper," by writing to the ASME Order Department, 29 West 39th Street, New York 18, N. Y., for which there is no charge providing you state that you are a member of ASME.

(*For Meetings of Other Societies, see page 131*)

Neither transit strike nor heavy snow storm could keep these members of the Arrangements Committee chairmen at home in December. They are: K. F. Treschow, Publicity; C. J. Zetler, Jr., Registration; E. S. Howarth, General Chairman; W. R. Stamm, Hotel; and K. P. Powers, Finance. They were making plans for the ASME Plant Maintenance and Engineering Conference to be held in Pittsburgh, Pa., April 14–15, at the Penn-Sheraton Hotel.

Higher Education, Science, and Technology Conference Held in Chicago, Ill., Oct. 31-Nov. 2, 1957

With the theme "Engineering and Scientific Education Foundation of National Strength" providing a core of thought, more than 300 persons representing education, industry, and government convened at the Edgewater Beach Hotel, Chicago, Ill., October 31 through November 2, 1957, for discussions of problems dealing with scientific and engineering education. Enrollments in institutions of higher learning, it was noted, have swollen markedly in recent years, yet there is an ever-growing concern that many talented young men and women will not enjoy the privilege of attending colleges and universities because of lack of financial support.

The meeting was cosponsored by the National Academy of Sciences, the National Science Foundation, the Scientific Manpower Commission, and the Engineering Manpower Commission of Engineers Joint Council.

In three sessions 11 speakers projected their remarks within the framework of such inclusive topics as: (1) The Problem as Seen Abroad; (2) Critical Elements of the Problems at Home; and (3) Traditional Tools and New Dimensions.

An especially forceful presentation by Nicholas DeWitt of the Russian Research Center, Harvard University, proved significantly timely as Sputnik newly "orbited" overhead in outer space. He emphasized that the scientific advance in Russia is not simply a consequence of the capture and utilization of a few talented German scientists and engineers, but rather for the reason that "little Ivan has been learning more science than little Johnny." The Soviet effort has been persistent in the area of technology, he observed, and has been oriented to accomplish military, political, and economic superiority. He warned that continued complacency is sheer folly. In the past 30 years the number of engineering and science graduates has increased eight to tenfold, and in 1957, compared to the total graduates in such areas in the United States, the ratio was two to one. As regards quality, Russian scientists and engineers "are no worse prepared than our own."

A high light of the Conference was the dinner speech by President Lee A. DuBridge, California Institute of Technology, entitled, "The Best Is None Too Good." An unusually eloquent speaker, he reminded his audience that this country "can no longer trust to luck to get enough engineers." But his thesis was primarily a dramatic plea for an emphasis upon quality rather than quantity. "Make the peaks high, don't just fill in the valleys," he said, and added, "the pace of the whole effort is set by those at the top, possibly by ten men." One brilliant scientist or engineer may turn up more ideas than 50 people, he argued, so let us make certain this individual is provided a proper intellectual climate in which to develop.

Dr. DuBridge implored those present to use their influence to improve the selective processes, provide places for superior students to study uninhibited, and to seek methods for procurement of uncommon teachers who, once found, will have sufficient incentives to remain on faculties rather than to migrate elsewhere.

On the final day, a panel symposium on the subject "Preparing for the Task Ahead" was moderated by C. F. Rassweiler of the Johns-Manville Corporation. Twenty-five selected individuals answered written questions submitted by the conferees and debated controversial issues among themselves. The problems

were brought sharply in focus; the solutions must be realities in the determinable future if, in these United States, a new and lofty pillar of progress is to be built on a firm foundation of engineering and scientific education.

The conference concluded with a luncheon session which featured The Honorable Marion B. Folsom, Secretary of Health, Education, and Welfare, as principal speaker. He opposed any fundamental changes in the American education system despite deep concern over the dramatic advances of Soviet technological education.

Secretary Folsom dampened hopes of some leading educators in engineering and sciences that the furor over the Soviet satellite would force the Eisenhower administration to encourage drastic revision of curriculums in secondary schools and colleges.

He warned that this country must not imitate Russian education. To do so, he maintained, would be "tragic for mankind."

The aim of American education, he added, must continue to be the development of "broadly educated men who have the intellectual ability and the moral conviction to make those difficult and often unpopular decisions that determine the course of mankind's advance."

These qualities require not only a grasp of science, but also of the humanities, he said.

ASME Accreditation Seminar Held November 7-8 in Detroit

A UNIQUE event in the realm of engineering education—an Accreditation Seminar—was held at Detroit, Mich., Nov. 7-8, 1957. Sponsored by the Education Committee of The American Society of Mechanical Engineers, it was the first activity of such design. The aim was to disseminate more widely information relating to the accrediting methods of the Engineers' Council for Professional Development and particularly to stimulate an awareness of the responsibilities of ASME members in this concern.

An invited group of 65 interested persons from industry and schools of engineering assembled on the opening day at the General Motors Technical Center. Jess A. Davies, President of Stevens Institute of Technology, who spearheaded the planning, set the stage in his opening remarks by relating the history of this phase of the ECPD movement.

A skit by Professors Richard G. Folsom, University of Michigan, and Newman A. Hall, Yale University, dramatically portrayed "The Technique of an Accrediting Procedure," depicting with rare clarity the sequence of steps in the work of an inspection team when "on location."

A talk dealing with further aspects of the evaluation processes was presented at luncheon by Dean W. L. Everitt of the University of Illinois and chairman of the ECPD Education and Accreditation Committee.

After a specially conducted tour at the Technical Center in the afternoon, the conferees gathered for dinner to hear C. H. Linder, vice-president, engineering services of the General Electric Company.

His remarks were singularly appropriate, not only in relation to the theme of the meeting, but also because they were made immediately after the dinner group had heard President Eisenhower's televised science speech.

Years of concern with problems and progress in education, as observed by an enlightened industrialist whose organization employs vast numbers of the graduates of our colleges and universities, and only recently returned from a technical mission to Russia, Mr. Linder's comments and suggestions about the future in engineering education attracted the avid interest of his listeners.

At Rackham Memorial Building, in the quarters of the Engineering Society of Detroit, the second day of the seminar, two panel discussions were moderated by Prof. D. A. Ver Planck, Carnegie Institute of Technology, and Dean Edward McHugh, Clarkson College of Technology. The first provided an occasion for seminar participants to question the panel members about specific facets of the accrediting plan. The second dealt with the topic, "Trends in Mechanical Engineering Curricula." A spirited give-and-take demonstrated the intense interest on the part of the industrial people and a recognition of their stake in shaping educational programs in the days ahead.

Those in attendance expressed keen satisfaction with their experiences and many indicated a desire to co-operate in the accrediting function. It was emphasized also that the event should be considered as an inaugural of further activities of similar nature

Shown in Paris Sept. 19, 1957, for the signing of agreement for translation of Prof. Louis Bergeron's book "Water Hammer," are, *left to right,* Paul Bergeron, head of Maison L. Bergeron of Paris; C. E. Davies, then secretary, ASME; and S. Logan Kerr, Fellow ASME and chairman, Special Translation Committee and acting editor-in-chief. The translation is being done by several prominent engineers including Freeman scholars. The John R. Freeman Foundation is one of the sponsors of the project.

Second Inter-American Management Conference to Be Held in U. S.

"Managers for Expanding Economies" will be the theme of the Second Inter-American Management Conference, which will be held under the auspices of the Pan American Council of the Comité International de l'Organisation Scientifique (PACCIOS) from Nov. 16 to 21, 1958, at White Sulphur Springs, W. Va.

The Council for International Progress in Management (CIPM), the United States member of PACCIOS, will be host for the Conference. Leading management representatives from the PACCIOS member countries—Argentina, Brazil, Canada, Chile, Mexico, and Peru, as well as from all other Latin-American countries—will be among the 300 delegates to the Conference. The program will include major addresses by industrial leaders of the Western Hemisphere, panel discussions, and, for those who are interested, a large choice of workshops designed to explore some of the practical aspects of management that are particularly important in expanding industrial economies.

Complete programs for the Conference will be available in February, 1958. For further information, write to the Council for International Progress in Management, 350 Madison Avenue, New York 17, N. Y.

CIPM represents the United States management movement at the international level. Its membership includes leading management associations, corporations, and colleges of business administration. It is the official U. S. representative to the Comité International de l'Organisation Scientifique (CIOS), an international body with member committees in 29 countries of the free world. PACCIOS is the Western Hemisphere organization of CIOS.

ASME CODES AND STANDARDS WORKSHOP

Interpretations of 1955 Code for Pressure Piping

From time to time certain actions of the Sectional Committee B31 will be published for the information of interested parties. While these do not constitute formal revision of the Code, they may be utilized in specifications, or otherwise, as representing the considered opinions of the Committee.

Pending revision of the Code for Pressure Piping, ASA B31.1-1955, the Sectional Committee has recommended that ASME, as sponsor, publish selected interpretations so that industry may take immediate advantage of corresponding proposed revisions. Case No. 31 is published herewith as interim actions of Sectional Committee B31 on the Code for Pressure Piping that will not constitute a part of the Code until formal action has been taken by the ASME and by the American Standards Association on a revision of the Code.

Case No. 31

Inquiry: May steel pipe produced under ASTM specification A381-54T be used in construction that must comply with ASA B31.1 Section 8, Gas Transmission and Distribution Piping Systems? If so, what joint factor may be used?

Reply: It is the opinion of the Committee that pipe meeting the requirements of ASTM specification A381-54T meets the intent of the Code and may be used under ASA B31.1.8 and with a longitudinal joint factor E equal to 1.

Society Host to Philippine Standardization Study Group

A discussion of the role of the professional engineering society in national standardization was presented to an eight-member Philippine Industrial Standardization Study group October 31.

Participants were George Habach, Mem. ASME, vice-president in charge of engineering, Worthington Corporation, and chairman of Sectional Committee B5; P. L. Houser, Mem. ASME, president, Metal Cutting Tool Institute, past-chairman of ASME Standardization Committee; Granger Davenport, Mem. ASME, chief engineer, Gould & Eberhardt, member, Sectional Committee B6; and O. B. Schier, II, secretary, ASME, and Ernest Hartford, John Wilding, and Frank Philippbar of ASME staff.

The Study was organized by the Philippines Standards Association, sponsored by the Industrial Development Center, under the joint economic development program of the Philippine National Economic Council and the U.S. International Co-operation Administration. The Study program included industrial standardization methods in the United States, Great Britain, Japan, and some Western European countries.

PHILIPPINE STANDARDIZATION STUDY GROUP visit the United States. *Left to right,* Efren V. Mendoza; Benjamin R. Salonga, secretary; Hugo B. Fernandez, vice-chairman; Dr. W. Sauder, National Bureau of Standards, Washington, D. C.; Cesar H. Concio, chairman; Joseph Koski, project manager, International Co-operation Administration, Washington, D.C., Sir Justo N. Lopez; Gil O. Opiana; Remedios E. Racela; and Jose F. Lumban.

In Loving Memory

Mrs. U. A. Rothermel, twenty-first President, Woman's Auxiliary to the ASME, took office in January, 1957, died in office, Nov. 13, 1957

Annual Meeting of Woman's Auxiliary to The ASME

Reported by Mrs. John C. Gibb

THE Woman's Auxiliary to The American Society of Mechanical Engineers held its 34th Annual Meeting in New York, N. Y., Dec. 1 through Dec. 6, 1957. Three hundred seventy-five women from all over the country and from Canada registered at the Ladies' Headquarters in the Hotel Statler. The Meeting was saddened by the death of Mrs. U. A. Rothermel who, having been elected President at the 33rd Annual Meeting, would have been the honorary Chairman of this Meeting. Succeeding to Mrs. Rothermel's post as President was Mrs. R. W. Worley of Philadelphia Section.

Metropolitan Section Hostess

The Metropolitan Section was hostess to the visitors. Officers of the Annual Meeting Program were: Mrs. J. C. Gibb, general chairman; Mrs. W. H. Byrne, vice-chairman; Mrs. A. M. Perrin, vice-chairman; and Mrs. Erik Oberg, chairman of the Metropolitan Section.

Hospitality Committee

A special committee in charge of hospitality, called the Sunshine Committee, was established for this Annual Meeting, with Mrs. Verne Whitacre as chairman and Mrs. Crosby Field and Mrs. Adolph Ehbrecht, vice-chairmen. Representatives from this Committee, distinguished by their white "hostess" badges, were at Ladies' Headquarters throughout the week to meet and assist guests in every possible way.

Registration

Registration for women was held on Sunday, December 1 from 2:00 to 5:00 p.m. in the Pennsylvania Room of the Statler and every day thereafter from 8:30 a.m. to 6:00 p.m. Mrs R. W. Oakley was chairman of registrars. Mrs. R. E. Abbott, Mrs. Cecil Dunham, Mrs. A. C. Foster, and Mrs. Eugene MacNiece assisted her.

Early Bird Party

A record crowd of well over 500 ASME men and women attended the always popular Early Bird Party on Sunday at the National Arts Club. Mrs. Arthur Perrin, chairman of the party, Mrs. R. W. Cockrell and Mrs. Gordon Hahn, vice-chairmen, and their committee had decorated the club rooms with beautiful arrangements of gold chrysanthemums and greens. While punch was served and the guests helped themselves at the buffet table, A. H. Moody at the piano provided background music. The popularity of this event was attested to by the fact that the guests came early and stayed late.

The Coffee Hours

On Monday and Tuesday mornings, coffee was served in the Cornell Room adjoining the Pennsylvania Room so that the guests after registering could get together with their friends in a relaxed atmosphere. Mrs. W. H. Larkin, chairman of the Monday Coffee Hour was assisted by Mrs. C. M. Hickox, vice-chairman. Mrs. Jess Davis, chairman of the Tuesday Coffee Hour was assisted by Mrs. G. T. Felbeck and Mrs. W. E. Scoville, Jr., vice-chairmen.

Annual Tea Dance

The Tea Dance was held in the Hotel Statler's Grand Ballroom on Monday, from 4:00 to 7:00 p.m. Thanks to the expert management of the chairman, Mrs. Harry Kessler, and her vice-chairmen, Mrs. W. H. Byrne, Mrs. R. B. Purdy, and Mrs. E. J. Sharkey, Jr., it was a beautiful affair. Guests were served from a table with an impressive centerpiece of yellow chrysanthemums. Pouring for the occasion were Mesdames Byrne, Gompf, Crans, Bradley, Goetzenberger, Hickox, Landis, Landrey, Allardt, Karg, Worley, Hahn, Kent, Parsons, Miller, and Gugeler. Jim Harkin's Orchestra provided enjoyable music for the 375 persons who attended.

Night Club Tour

Under the expert guidance of Glass Dome Tours, 53 persons left the Hotel Statler Monday evening in a private bus for the famed Copacabana where a delicious dinner was served and a popular floor show was provided. Marion Marlowe, Buddy Hackett, and the "Copa" girls made quite a hit with the group. The next stop was Birdland on Broadway where devotees of "cool" jazz had a fine time. From there the party went to the Hawaiian Room of the Hotel Lexington for the colorful midnight floor show, and dancing. They finally returned to the Statler with leis, coconuts, and other souvenirs, all agreeing it had been a grand tour. Mrs. J. W. Wilkenfeldt was chairman

and Mrs. E. J. Sharkey, Jr., vice-chairman.

President's Breakfast

Tuesday morning in the Statler's Cafe Rouge, the National Board breakfast was scheduled with about 50 Board members and delegates attending. Immediately after breakfast a meeting was held, presided over by Mrs. R. W. Worley, president. To begin the meeting, Mrs. Worley asked for a moment of silent prayer. She then paraphrased a passage from the "25th Anniversary History" (page 19) to read as follows: "In the death of its President, Mrs. U. A. Rothermel, the Woman's Auxiliary to The ASME has sustained a severe loss. Her efforts on behalf of the Auxiliary are highly appreciated and will not be forgotten." Instead of formal reports, the meeting was given over to the free and informal exchange of ideas between Section Chairmen, Delegates, Sponsors, National Officers, and Chairmen of the Standing Committees.

Sight-Seeing Tour of New York City

At 10:00 a.m. private buses took about 60 women from the Statler to tour downtown New York. Under the direction of Glass Dome Tours, the group made a stop at The Little Church Around The Corner, then went on to visit Chinatown, to view the waterfront at Battery Park, the financial district, including Trinity Church, the newly decorated City Hall, and back to Greenwich Village. A stop was made for those who wished to leave the tour and go to the United Nations buildings. The tour concluded at Helena Rubenstein's Park Avenue apartment in time for the brunch scheduled there. Mrs. Christian Bertelsen as chairman and Mrs. Marie Michal as vice-chairman had charge of this event.

Brunch at Princess Gourielli's

The brunch at Princess Gourielli's (Helena Rubenstein's) apartment, 625 Park Avenue, was a glamorous affair. With the able assistance of Mrs. Rudolph Gagg, chairman, and Mrs. J. J. Moro-Lin and Mrs. Verne Whitacre, vice-chairmen, guests enjoyed an unusual buffet-style luncheon served in the imposing dining room and a tour of all three floors of the apartment. Madame Rubenstein's famous collection of opaline glass, African sculpture, European miniatures, modern French paintings, and miniature period room settings was much admired. After brunch, all repaired to the top floor, an art gallery designed and executed by Cecil Beaton. Here Mrs. Gibb officially welcomed the ladies on behalf of Metropolitan Section, hostess section for the Annual Meeting, and introduced Mrs. Worley who extended greetings. Mrs. Gagg then introduced Miss Mala Rubenstein, niece of Madame Helena Rubenstein, and director of all Rubenstein Salons throughout the world.

Auxiliary Workshop

On Tuesday afternoon an Auxiliary Workshop was held in the Cornell Room. This was an innovation in programming planned to provide an occasion for members to discuss Auxiliary matters with national officers and standing committee chairmen. Mrs. Worley, chairman of the event, took the opportunity to stress that there was an Auxiliary language, and to express the hope that members would use the following terminology in discussing Auxiliary matters or in writing reports: Annual Meeting (instead of convention), Sections (instead of chapters), chairmen of Sections (instead of presidents of Sections) and Woman's Auxiliary (instead of ladies' auxiliary).

Hawaiian Night

More than 200 men and women attended the informal Hawaiian Night "Get-Together" in the Georgian Room on Tuesday. Each guest was warmly greeted at the door and given a lei to wear. The women were presented with orchids that had been sent by air from the ASME Auxiliary Section in Hawaii, in memory of Mrs. U. A. Rothermel, especially for the Hawaiian Night program.

Mrs. Floyd Vermilya, chairman of the event, introduced the trio of Hawaiian entertainers, two musicians and a dancer, who, through the courtesy of Pan American Airways, presented an entertaining program.

J. T. Reid and U. A. Rothermel, both of New York, and H. B. Atherton of Kansas City, pleased the guests by showing colored slides taken on a trip to Hawaii after the 1957 Semi-Annual Meeting in San Francisco. Many members of the audience who, too, had taken the trip found themselves in the pictures. Mr. Rothermel also had fine colored movies of Hawaii to show.

Coffee and punch with cocoanut cookies were served at 10:00 p.m. from the buffet table which was attractively decorated with tapa cloth, pineapples, and orchids. At this time, Mrs. Vermilya introduced Ernest Hartford and urged all who had been on the Hawaiian trips with him to rally around for a reunion. A hula dance contest was then held. Mrs. Arthur Perrin won the ladies' prize. William H. Byrne in close competition with William F. Ryan, V. Weaver Smith, and several other determined contestants, won the men's prize. This turned out to be a grass skirt, which Mr. Byrne donned, and then with the professional dancer performed a duet that delighted all.

Assisting Mrs. Floyd Vermilya was Mrs. W. D. Temple, vice-chairman. Mrs. T. A. Burdick, also a vice-chairman of the event, was prevented by her husband's illness from attending.

Annual Business Meeting

The Annual Business Meeting was held Wednesday morning in the Hartford Room, with Mrs. Worley presiding. The 80 or 90 women who attended all stood in a moment of silent prayer in tribute to Mrs. Rothermel. William F. Ryan, outgoing ASME President, and J. N. Landis, incoming President, visited the meeting and were introduced by Mrs. Worley as were Mrs. Landis and Mrs. Landrey, Dr. Ryan's daughter.

All officers gave reports. Mrs. Worley's being, in substance, that of Mrs. Rothermel. Mrs. Arthur Perrin reported a notable increase of six in the number of new Sections, bringing the total number of Sections to 27. Mrs. Walter Friend, chairman of the Student Loan Fund; Mrs. Allan Cullimore, chairman of the Calvin H. Rice Memorial Scholarship Fund; and Mrs. Ralph Goetzenberger, chairman of the Sylvia W. Farny Scholarship Fund, all reported.

It was voted to establish a new Scholarship Fund to be known as the Marjorie Roy Rothermel Scholarship Fund. It was voted to place reports from Section chairmen in the minutes of the meeting.

D. W. R. Morgan, past-president and Fellow ASME, and Mrs. Morgan visited the meeting and were introduced by Mrs. Worley. Dr. Lillian M. Gilbreth, Hon. Mem. ASME, and Metroplitan Section, who attended the meeting, graciously extended greetings after being introduced by Mrs. Worley.

The proposed changes in the Constitution were accepted by vote. Mrs. Allison Bayles, chairman of the Nominating Committee, reported for the Tellers of Election who included Mrs. W. L. Markert and Mrs. Joseph Waitkus. The new officers were introduced. They are: Mrs. R. W. Worley, Philadelphia, President; Mrs. W. F. Friend, New York, first vice-president; Mrs. A. M. Gompf, Baltimore, second vice-president; Mrs. J. M. Pilcher, Columbus, third vice-president; Mrs. J. L. Wilkins, Nebraska, fourth vice-president; Mrs.

E. H. Rothermel, Hawaii, fifth vice-president; Mrs. C. N. Kent, New York, recording secretary; Mrs. E. S. Bristol, Philadelphia, corresponding secretary; Mrs. G. R. Hahn, New York, treasurer; Mrs. J. W. Wilkenfeldt, New York, assistant treasurer.

The following were appointed to the Nominating Committee for next year: Mrs. R. C. Crans, Detroit; Mrs. George Gethen, Philadelphia; Mrs. P. T. Lagrone, Pittsburgh; Mrs. William Larkin, New York; Mrs. J. M. Pilcher, Columbus.

Annual Luncheon and Fashion Show

The Annual Meeting Luncheon in the capable hands of Mrs. E. Oberg, chairman, and Mrs. W. Hausmann and Mrs. T. H. Wheelock, vice-chairmen, was a beautiful affair held in the Crystal Ballroom of the Park Lane Hotel, on Wednesday. Three arrangements of gilded magnolia leaves in combination with many varieties of flowers in pink adorned the head table which was laid with pink linen as were the other tables. Before luncheon Mrs. Gibb announced that in tribute to Mrs. Rothermel the Lord's Prayer (Malotte) would be sung. Miss Arden Anderson, the soloist, a member of the Metropolitan Section, was accompanied at the piano by Mrs. Loretta Novotny. Honor guests on the dais were Mrs. Landis and Mrs. Landrey. Others on the dais besides Mrs. Oberg, Mrs. Hausmann, Mrs. Wheelock, Mrs. Gibb, Mrs. Worley, and Mrs. Clapper were Mrs. W. H. Byrne and Mrs. Arthur Perrin, vice-chairmen of the Annual Meeting, and the following National Officers: Mrs. E. S. Bristol, Mrs. R. L. Goetzenberger, Mrs. T. S. McEwan, and Mrs. Gordon Hahn. Following the luncheon Mrs. Worley extended greetings to all and announced her desire to do all that she as one person could do to aid the Auxiliary in her new post as National President. The meeting was then turned over to Mrs. Oberg who introduced Mrs. Raymond Clapper, Washington Director of CARE, who spoke dramatically of the need for food and support in the countries which CARE services and which she had just visited. Her topic was "Side-by-Side—The Space Age and Hunger." Her talk raised a number of questions from the audience which she answered vividly and to the point.

A special table had been arranged for past-presidents and another for wives of members of the Council of ASME. Mrs. Oberg called on these ladies to stand one by one so that she could present them.

It was then time for the Jane Engel Fashion Show, "Around the World in Fashion," to begin. Eight models including three Auxiliary members, Miss Anderson, Mrs. Renato Casci, and Mrs. William Wockenfuss, modeled cruise, sport, and cocktail clothes from Jane Engel shops, furs by Georgeou of White Plains, and Judith McCann, design jewelry. Mrs. Irma H. Amberg of Jane Engel's White Plains Shop was commentator while Mrs. Novotny at the piano supplied a musical background. A charming finale was provided by the models who came out together on the runway and posed, as Miss Anderson in a pretty cocktail dress sang, "I Could Have Danced All Night" from "My Fair Lady" (Lerner and Loewe).

A drawing was then held for the door prizes which had been contributed for the event by many business firms and beautifully wrapped in pink paper by the committee. Guests as they left were able to make Christmas gift selections from lingerie, perfume, and jewelry brought and displayed by Mrs. Amberg from the Jane Engel Shops.

India Program

Coffee was served in the Cornell Room, Thursday morning, under the chairmanship of Mrs. Randall Purdy, assisted by Mrs. G. A. Harman and Mrs. A. M. Feldman, vice-chairmen, to about 50 women eagerly awaiting the arrival of Mrs. C. H. Kent, past-chairman of the Metropolitan Section. Mrs. Kent has recently returned from a three years' stay in India. Bad weather prevented her bringing the saris which she hoped to model and her collection of dolls with native costumes of India, but she had beautiful 35-mm colored slides which she showed with a delightful commentary.

Luncheon and Tour

The final luncheon held in the Downtown Athletic Club high up on the seventeenth floor, commanding a beautiful view of the Hudson River, was held Thursday with 60 in attendance.

The luncheon was preceded by a musical invocation, a selection from Handel's "Messiah," sung by Miss Arden Anderson who accompanied herself at the piano. Under Mrs. W. F. Friend's direction as chairman, the head table was adorned with a lovely centerpiece of orchid-toned flowers. The delicious luncheon was followed by the honoring of the Auxiliary's new Sections. Mrs. Worley presented corsages to their chairmen, sponsors and/or delegates as follows: Mrs. E. W. Allardt, chairman, and Mrs. Anderson Peeler, sponsor, for Canton-Alliance Massillon; Mrs. E. J. Sharkey, Jr., sponsor, Providence; Mrs. G. T. Felbeck, sponsor, and Mrs. Thompson Chandler, delegate, West Virginia; Mrs. T. N. Graser, sponsor, and Mrs. D. R. Baker, delegate, Kansas City. Hawaii, South Texas, and San Francisco had no representation at this luncheon. A corsage

Officers of the Annual Meeting Committee, seated *left to right,* are Mrs. Erik Oberg, chairman of Metropolitan Section, Hostess Section; and Mrs. J. C. Gibb, general chairman, Annual Meeting. Standing *left to right:* Mrs. Arthur Perrin, vice-chairman, Annual Meeting; and Mrs. W. H. Byrne, also a vice-chairman.

was presented to Mrs. Arthur Perrin for her fine work as Expansion Chairman on the National Board which was instrumental in bringing in the new Sections. Mrs. Worley also presented to Mrs. Karg, immediate past-president, a corsage.

Metropolitan Section officers were asked to stand for presentation. Mrs. Friend then announced the arrangements which she and her vice-chairmen, Mrs. C. L. Dunham and Mrs. J. M. Labberton, had made to expedite the tours to the Stock Exchange and to the Federal Reserve Bank. Before leaving for the tours, Mrs. Perrin as vice-chairman of the Annual Meeting and Mrs. Oberg as chairman of the Hostess Section (Metropolitan) were called upon by Mrs. Gibb for the final farewells.

Thanks to the preliminary planning, the excellent maps, and directions so efficiently supplied by Mrs. Friend for the tours, they started on time and went off as scheduled, providing much unusual information for those who participated.

This brought to a close the long-planned Annual Meeting Program. The Metropolitan Section hopes that all who took part have new Auxiliary friendships with which to credit the Meeting and will return to their respective Sections with renewed interest in Auxiliary activity as a result of this Meeting.

Conducted for the National Junior Committee

N.J. VIEHMANN[1]

JUNIOR FORUM

Warren R. Thompson, outgoing chairman, National Junior Committee, addresses Junior Session during 1957 ASME Annual Meeting

Junior Session at Annual Meeting

As PART of its program to create an awareness among young engineers of the necessity and opportunities for development after graduation, the National Junior Committee presented a distinguished panel during the ASME Annual Meeting in New York on December 3.

Edwin L. Yates, director, technical personnel relationships, General Motors Corporation; Eugene C. Bailey, system mechanical and building engineer, Commonwealth Edison Company, Chicago; Prof. E. T. Donovan, acting dean, College of Technology, University of New Hampshire; and Ralph W. Miller, partner, Miller, Schuerholz, and Gipe, Baltimore, Md., spoke to some 60 interested engineers.

Mr. Yates summarized the formation of the Engineers' Council for Professional Development program in Detroit through which men in management in more than 300 companies there have become aware of the responsibility of the company to assist the young graduate engineer to achieve practical engineering competence and professional stature.

Mr. Bailey enumerated the techniques employed by his company to assist young engineers to increase their value to the organization through their own professional development.

Professor Donovan discussed the values derived from attaining the Professional Engineer's License and outlined the history of Professional Registration.

Mr. Miller described the benefits of active participation in a professional society. He pointed out that one cannot reach the full potential of his capabilities as a "lone wolf." It is necessary to mingle with those men who have attained professional stature. The opportunity to observe and listen to the many outstanding men of great accomplishment who attend society meetings is of significant value to the young engineer. A second benefit is the opportunity to serve the profession by functioning in society activities on the local (Section or Region) or national level. This activity is a means of achieving professional attitudes. These are developed further by reading the discussions concerning professional attitudes in the society publications. Mr. Bailey aptly commented that the professional society is the engineer's "window to the world," through which he can keep himself abreast of the latest technical achievements and professional attitudes.

Mr. Yates, 1957 chairman of the ECPD Committee on Professional Training, presented an outline of the program developed by the Committee to guide young engineers in their first five years following graduation:

1 Orientation and Training in Industry.

2 Continued Education.

3 Integration into the Community.

4 Professional Identification.

5 Self-Appraisal.

6 Selected Reading.

(A detailed explanation of these points is found in the pamphlet "The First Five Years of Professional Development" and is available from the Engineers' Council for Professional Development, Room 13-217, 3044 West Grand Boulevard, Detroit 2, Mich.)

His description of his Committee's efforts to secure the interest of industrial management in point one of the aforementioned program and how they were trained to train young engineers was extremely interesting.

Mr. Bailey outlined the following obligations of a company to its young engineers:

1 See that they are given engineering work to perform.

2 Give them the opportunity to see the company and learn the various facets of its organization and operation.

3 Encourage them to continue their education, to attain professional registra-

[1] Western Electric Company, North Andover, Mass. Assoc. Mem. ASME.

tion, and to participate in some form of activity in a professional society.

Professor Donovan pointed out that the profession is improved as the number of legally recognized engineers is increased. Although Professional Registration originated in 1907, when the first state law was enacted in Wyoming, there were only 20,000 Registered Engineers in this country by 1940. Not until 1946 did all 48 states have registration laws. In 1950, there were 150,000 registered Professional Engineers. Today there are 210,000, yet this is only one third of all engineers. To obtain a license, a candidate must present a record of at least four years of experience satisfactory to the examining board. Although specific requirements vary between states, it is basic that the engineer must have achieved a status of competence in order to merit the recognition of licensure.

Registration represents a certification of the engineer's qualifications. It provides professional identification and recognition and in many cases, added income. "There is a trend in industry today which sanctions the policy of recognizing that the title 'engineer' be reserved solely for one so qualified by registration. All industry is becoming more alert to the desirability of having registered engineers in its employ. Such a policy has a definite public appeal and affords some protection to the organization."[2]

Warren R. Thompson, power engineer, United Engineers and Constructors, Philadelphia, Pa., was chairman of the Session. Richard Searle, sales engineer, Jones and Lamson Machine Company, Springfield, Vt., acted as vice-chairman. Mr. Thompson was chairman of the National Junior Committee in 1957 and Mr. Searle is vice-chairman of the Northern New England Section of ASME.

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[2] J. D. Constance in an article in *Power Engineering*, Sept., 1946.

E. J. Yates, personnel staff, General Motors Corporation, who was a panelist at Junior Session during the 1957 ASME Annual Meeting

Apply for Freeman Fellowship for Study or Research in Hydraulics

Qualified members of the American Society of Civil Engineers or The American Society of Mechanical Engineers, who have a worthy research program in hydraulics or related fields, may apply for Fellowship support to the Freeman Award Committee of ASCE in an amount not exceeding $3000, depending on the need claimed in the application.

ASCE and ASME are each administrators of a Freeman Fund. The Freeman Award Committees make awards through these Societies in alternate years (through the ASME Committee in 1958). The conditions under which Fellowship applications will be studied are the following:

1 Each applicant must submit a study or a research program covering a period of at least nine months starting in 1958. Each shall include a statement of the funds needed from the Fellowship.

2 Each applicant shall furnish evidence of his qualifications to carry out the proposed program.

3 Applicants must be citizens of the United States and members in some grade of either of the two co-operating Societies.

4 Applications must be submitted to the Freeman Award Committee, c/o Secretary, The American Society of Mechanical Engineers, 29 West 39th Street, New York 18, N. Y., by March 1, 1958.

5 Announcement of the Award will be made in April, 1958.

6 A report in English must be made by the awardee within 60 days after completion of his project.

7 The income from the Fund is to be used in the aid and encouragement of young engineers, especially in research work for:

(*a*) Grants toward expenses for experiments, observations, and compilations to discover new and accurate data that will be useful in engineering.

(*b*) Underwriting fully or in part some of the loss that may be sustained in the publication of meritorious books, papers, or translations pertaining to hydraulic science and art which might, except for some such assistance, remain mostly inaccessible.

(*c*) A prize for the most useful paper relating to the science or art of hydraulic construction.

(*d*) A traveling scholarship, open to members younger than 45 years, in any grade of membership, in recognition of achievement or promise; and for the purpose of aiding the candidate to visit engineering works in the United States or any other part of the world where there is good prospect of obtaining information useful to engineers.

(*e*) Assisting in the translation or publication, in English, of papers or books in foreign languages pertaining to hydraulics.

ASME Conference to Feature Technology Theme

"International Geophysical Year: Technology at the Threshold," will be the theme of the 1958 Conference of the Professional Divisions of the Southern California Section of The American Society of Mechanical Engineers scheduled for February 17 at the Hotel Huntington-Sheraton, Pasadena, Calif.

The conference will consist of three sessions, with seven professional divisions participating. L. J. Ortino, chief mechanical engineer, Beckman Instruments Inc., is general conference chairman.

Tentative speakers and subjects selected to date include: Radio Astronomy in IGY, speaker, John G. Bolton, California Institute of Technology; Satellite Instrumentation and Tracking, speaker, Henry L. Richter, California Institute of Technology; Environment of a Satellite Re-Entry Body, speaker, Robert Bromberg, Ramo-Wooldridge Corporation; Energy Sources of the Future, speaker, R. C. Allen, Allis-Chalmers Manufacturing Co.

Applied Mechanics Reviews Completes Tenth Year of Publication

With the December, 1957, issue, *Applied Mechanics Reviews*, edited at The Southwest Research Institute in San Antonio, Texas, and published monthly by The American Society of Mechanical Engineers completed ten years of publication. Martin Goland, Mem. ASME, vice-president, and director, SRI, is the editor.

"Surveying some 10,000 technical journals and 300 books in 20 languages, written in eight different alphabets, each year is no small task," the editors of AMR agree.

"Not all 20 languages are read here," says Stephen Juhasz, Mem. ASME, executive editor, who every Monday faces a stack of mail three feet high. Dr. Juhasz reads only 12 languages; the other eight are farmed out to associate editors in the United States and overseas.

The *Reviews* presents a capsule summary of the best of articles in the engineering sciences from some 30 countries.

Truly international in scope, the *Reviews* receives technical publications from all Iron Curtain countries. Reviewers are located in all those countries, with the exception of Russia. Reviewers in Communist China were once students or teachers in the United States and arrangements were made at that time for their services.

With the tremendous amount of technical literature being published, there is a great need for such a reviewing service, Dr. Juhasz notes.

He tells the story of the brilliant mathematician and physicist, Enrico Fermi, who found it easier to develop the theory to fit a problem than to try to locate the relevant literature.

The *Reviews* is published in English and circulates to all major countries.

Once an article or book has been scanned and is considered to merit inclusion in the *Reviews*, it is passed on to one of some 1500 reviewers whose interests and experience show him to be qualified to do the review. Reviewers are located in 35 countries. All reviewers and the associate editors who scan those other eight languages are unpaid. Some 4000 reviews are published yearly in the *Reviews*.

The *Reviews* also maintains a microfilm service, and all items published in it may be purchased on microfilm from the depository at Linda Hall Library in Kansas City. Also, according to a new exchange arrangement, microfilms will be sent from Russia to *AMR* so that reviews will be available from the Russian Referat. *Zhurnal Mekhanica*, Russian counterpart of *AMR*. In addition, about 20 Russian magazines are regularly being scanned by the editors. This does not include the material involved in the microfilm exchange arrangement.

Editorial offices were located first in Chicago, then Kansas City, and were moved to San Antonio in 1955 when Editor Martin Goland went to Southwest Research Institute as vice-president.

Born out of a dearth of technical information needed by the Office of Naval Research and by others in industry and the universities, AMR has grown steadily in size, scope, and critical acceptance, until today it stands as one of the major periodicals of its kind in the world. How many readers the *Reviews* has is almost impossible to determine, as most of the subscribers are libraries.

Following World War II, when technical journals in Germany, including *Zentralblatt für Angwandte Mechanik*, ceased publishing, a group of far-sighted individuals decided that a periodical to replace the defunct *Zentralblatt* should be published in the United States. The American Society of Mechanical Engineers agreed to organize a review magazine, under the name of *Applied Mechanics Reviews*. During this time, it has been given considerable financial support by government agencies, the ASME, and the National Science Foundation because the *Reviews* has not been self-supporting.

Because of the steady drain being made on the limited resources of the ASME

Artist's concept of the recently completed building on the SRI "Campus" in San Antonio, Texas, where *Applied Mechanics Reviews* is edited

***AMR* editorial staff shown in the office are, *left to right*, Florence Salinas, assistant editor; Martin Goland, AMR editor and director, Southwest Research Institute; Sharon Gardiner, assistant editor; Norman Abramson, associate editor; Dinah Lee Callan, assistant editor; and Stephen Juhasz, executive editor**

Development Fund, it was decided, in 1955, to discontinue this form of subsidy and place the periodical in a more self-supporting position.

As a first step the production operation was carefully scrutinized, and in 1956 important changes were instituted in the printing and processing procedures. This reduced the production cost, but more important, stabilized these costs in the face of general price increases in the printing industry. This was accomplished with no appreciable effect in the quality or the appearance of the magazine.

The 1956 increase in the subscription price to $25 a year has resulted in almost 50 per cent more income from this source. This, coupled with the economy measures taken, has placed the *Reviews* in a much healthier financial condition, but the periodical is still dependent on government support.

The future has its bright spot in that this will be the first year that the *Reviews* has operated without the need for out-of-pocket financial assistance from the Society. However, government assistance continues to play too vital a factor for ASME to be complacent or to consider this publishing venture completely secure. Further development to stimulate the interest and support of industrial organizations is necessary. Renewed efforts are being directed toward this end.

ENGINEERING SOCIETIES PERSONNEL SERVICE, INC [Agency]

These items are from information furnished by the Engineering Societies Personnel Service, Inc., in co-operation with the national societies of Civil, Electrical, Mechanical, and Mining and Metallurgical Engineers. This Service is available to all engineers, members or nonmembers, and is operated on a nonprofit basis.

In applying for positions advertised by the Service, the applicant agrees, if actually placed in a position through the Service as a result of an advertisement, to pay a placement fee in accordance with the rates as listed by the Service. These rates have been established in order to maintain an efficient nonprofit personnel service and are available upon request. This also applies to registrant members whose availability notices appear in these columns. Apply by letter, addressed to the key number indicated, and mail to the New York office.

When making application for a position include six cents in stamps for forwarding application to the employer and for returning when necessary. A weekly bulletin of engineering positions open is available at a subscription of $3.50 per quarter or $12 per annum for members, $4.50 per quarter for nonmembers, payable in advance.

NEW YORK	CHICAGO	DETROIT	SAN FRANCISCO
8 West 40 St.	84 East Randolph St.	100 Farnsworth Ave.	57 Post St.

Men Available[1]

Administrative Engineer, thoroughly familiar with management control techniques in the areas of supervision, organization, standardization, scheduling, budgetary controls, and human relations; 23 years' experience as engineering manager, chief draftsman, and standard engineer. Location open, New England preferred. ME-485.

Development/Application Engineer, BME, 27, two years in aircraft power-plant installation, three years in nuclear aircraft-engine-project design, and one year in research and gas-turbine laboratory facilities equipment design. Prefers Long Island or N. Y. area. ME-486.

General Manager, BS (AE), 48; manager engineering and manufacturing abrasive belt machines, for ten years, chief engineer wood furniture plant, for four years, group manager aircraft tooling, for two years, design engineer. Heavy welded pressure vessels for five years, ball-bearing application engineer for five years. Prefers U.S.A., South. ME-487.

Sales or Executive Manager, BSME, 45; 20 years of sales management, engineering, production, and cost experience in the fabrication of corrosion-resistant process equipment for the chemical, petroleum, pharmaceutical, and AEC field. Prefers New York metropolitan area. ME-488.

Industrial Engineer, BME, MIE, 28, seven year's industrial - engineering experience in methods, cost analysis and accounting, and production-improvement techniques. Considerable supervisory background in metal-products manufacturing. Prefers New York metropolitan area. ME-489.

Administrative Engineer, BSME, 45; seeks responsible position; broad experience in production supervision, plant and industrial engineering in synthetic fiber and machinery manufacturing. Prefers South. ME-490.

Sales and Promotion Engineer, BSME, BA Chemistry, 35. Seeks responsible position utilizing engineering, sales, advertising, market research, and business knowledge. Excellent background in sales engineering, administration, creative advertising and promotion, technical writing, and engineering design. Experienced in paper, aircraft, heating, and air-conditioning industries. Technical background included plant engineering, research, development, design, and purchasing. Location optional. ME-491.

Chief Development Engineer, BME; MSEA; 34; seven years as project engineer, design and development, and testing of automotive components; industrial lift trucks. Supervision of designer and test engineers. Prefers Midwest. ME-492-9455-Detroit.

Manager, Design, Development, or Research. Program, product, and personnel planning and development. Will upgrade or develop your present or future technical staff or product line. Productive and progressive experience from fundamentals to co-ordination of design, development, and research in appliances, power plants, light to heavy machinery, ordnance, etc. MSME; registered. ME-493.

Chief Industrial Engineer or Works Manager, EE; 51; 30 years private industry and professional, all facets of IE including heavy standard costs and budgetary control, production control. Also held positions in plant management. Prefers Northeast. ME-494.

Sales or District Manager, BSME, PE, 36; eight years' experience in handling sale of hydraulic turbines, crest gates, hoists, valves, racks, rakes, and axial flow pumps to public and private utility groups. Desires Midwest office of heavy equipment manufacturer. Will consider sales representative line of West Coast firms desiring contacts with Midwest consulting firms. Prefers Chicago. ME-495-842-Chicago.

Engineering Executive, PhD, MSME, MSEE; 45, registered; twelve years management and consulting in manufacturing and construction, five years research and instructing, six years operation and plant engineering. Good background in applied thermodynamics, heat transfer, and steam-power-plant field. Location open. ME-496.

Chief Engineer, BSME, 35; 11 years research and development on missile and aircraft accessories, and systems engineering. Managerial background in co-ordinating, organizing, and selling. Experienced in building up engineering organization and product line. Prefers Northeast. ME-497.

Plant Engineer, BS (ME), 53; P.E., New York; 13 years charge of power plant, and repair and maintenance of a paper mill. 15 years equipment layout, piping, and design. Prefers New England. ME-498.

Production Planning Manager, BSME, 36, industrial engineer and industrial-engineering section supervisor for leading home appliance manufacturer, eight years. Manager of production control, stockroom, and shipping for conveyer company, three years. Prefers East or Midwest. ME-499-9457-Detroit.

Mechanical Design and Development—Small Mechanical or Electromechanical Devices, 28, ME. Varied experience in manufacturing, development, test-machine design, and drafting-room administration with large eastern firm and U. S. Navy. Some training in creative engineering principles. Any location. Located in Calif. A-597.

Mechanical Engineer-Manager, 28, ME, three years application engineer, heavy machinery, with some design experience. Worked with customer and salesmen. Prefers San Francisco, Colo., or Ariz. Located in Calif. A-600.

Manufacturing, Production, Superintendent, (engineering department and shop), heavy machinery and equipment, 38, ME, 17 years' experience chief engineer project, development, manufacturing engineer, production of heavy machinery and equipment (reactors, textile and paper mill, aircraft power, electronics, pressure vessels, heat exchangers) mechanisms, structural plate, weldments for manufacturer, assemble, fabrications. Includes tooling design and application (shop and engineering department). Prefers San Francisco Bay area. Located in Calif. A-610.

Project, Development, Manufacturing, Application-Fluid Mechanics: 37, 12 years' experience with commercial, special, and military pumps in research, development, production, application of hydraulics, industrial design, test experiment, sales, and commercial usage. Prefers Calif. or Midwest. Located in Calif. A-654.

Design, Development, and Test-Pumps, Valves, Water Systems, Air-Conditioning and Refrigeration, Steam or Hydropower: 36; ME, two years design, development, and test of centrifugal jet and turbining pumps. Six months design of metal-forming dies. Equipment selection. One and a half years pilot-plant operator. Prefers San Francisco. Located in San Francisco East Bay. A-668.

Positions Available

Director, Engineering Standards, graduate mechanical, preferably with advanced degree, 38–45, experience in large organizations in field of heavy machinery, automotive manufacturing, or similar fields. Must be familiar with ASME Standards; and organization, and administration of standards and procedures for large industry. $16,000–$18,000. Northeast. W-5550.

[1] All men listed hold some form of ASME membership.

Chief Research Engineer, graduate mechanical, high-caliber executive engineer, considerable administrative ability in addition to good background in mechanical-engineering field, for company which designs and produces manufacturing equipment for the metalworking industries. Equipment includes tube mills, roll-forming mills, for both ferrous and nonferrous metals, slitting lines and allied equipment, welders as applied to the making of piping and tubing, and equipment allied to these main lines. Should have engineering experience that will allow applicant to readily comprehend the problems involved in this type of work. Will plan and execute functions of department at a high level of responsibility. Salary open. Midwest. W-5554.

Plant Engineer, mechanical or electrical graduate, for top staff position in leading multiplant operation in durable steel-products field. Must be experienced in work involving design of new and modified plant facilities, and supervision of erection and installation. Superb program of compensation, benefits, and paid retirement. Apply by letter giving full particulars. Mo. W-5559.

Industrial Engineer, college degree or equivalent, 35–40, preferably engineering or business major; 12 years' good experience in industrial engineering or accounting systems and procedures; production and/or quality control, marketing and market research, industrial relations, organization or corporation finances. Will handle assignments as consultant or manager for established firm. Headquarters, San Francisco for Western states (weekends at home assured). $12,000–$15,000. Company pays placement fee. W-5561.

Co-ordinator of Distributor Sales, ME degree or equivalent, under 55, to co-ordinate sales of two, three, and four-way solenoid valves through industrial distributors in continental U.S. Must have working knowledge of solenoid valves and application; experience with distributors and with manufacturing. $8000–$10,000. Company will pay placement fee. Northern N. J. W-5566

Professor to head up Department of Mechanical Engineering; PhD preferred; some industrial experience as well as teaching experience required. Interests should be in machine design, thermodynamics, etc. $8400–$9500 for nine months; 15 per cent additional for six-weeks summer teaching. Available September, 1958. Southwest. W-5575.

Design Engineer, mechanical graduate, machinery design and development experience covering mixers, coaters, cutting and packaging, or allied equipment. $8000–$9000. N. J. W-5579.

Development Engineer, mechanical graduate, design and development experience on valves, temperature and pressure regulators, controls, etc. $7000–$8000. Eastern Pa. W-5580.

Manager, mechanical or electrical graduate, operating and commercial operations of a small utility organization. Must have Latin-American experience. $10,000. Central America. F-5582.

Mechanical Engineer, graduate mechanical, experience in the design and assembly of automatic production machines. Will be required to de-bug present machines for maximum production efficiency, trouble shooting, designing improvements. To $9000. Mass. W-5583.

Production Superintendent, preferably degree in engineering, 35–45, eight to ten years in paper converting in the following fields in order of preference: grocery bags, cellophane, Kraft tissue, folding cartons. Some Spanish desirable. To $10,000 a year. Caribbean area. F-5588.

Project Engineer, mechanical graduate, 25–40, at least one year in pulp and paper mill if possible; three years or better in other types of plants. Under direction of planning engineer, will determine materials, manpower, and cost for each project; make layouts, details, and final drawings for project concerned; revise existing engineering records and drawings, show changes and/or additions, etc. $6600–$7800. W-5602.

Industrial Consulting Engineers, five to ten years' experience with consulting firm, in methods, time study, standard data, production, materials handling, inspection, and quality control. Must be well versed in all phases of business management, organization training, sales forecasting, budgeting, operational phases. Machine-shop work for company employing about 3000 men. $7800–$9100, plus $80 per week expenses; air travel to and from assignment furnished. Duration, six to 12 months. Denmark. F-5617.

Engineers. (a) Production superintendent, 35–40, mechanical graduate, at least ten years' supervisory experience in structural steel fabri-

Keep Your ASME Records Up to Date

The ASME Secretary's Office depends on a master membership file to maintain contact with individual members. This file is referred to countless times every day as a source of information important to the Society and to the members involved. All other Society records are kept up to date by incorporating in them changes made in the master file.

The master file also indicates the Professional Divisions in which members have expressed an interest. Many Divisions issue newsletters, notices of conferences or meetings, and other material. You may express an interest in the Divisions (no more than three) from which you wish to receive any such information which might be published.

Your membership card includes key letters, below the designation of your grade of membership and year of election, which indicate the Divisions in which you have expressed an interest. Consult the form on this page for the Divisions to which these letters pertain. If you should wish to change the Divisions you have previously indicated, please so notify the Secretary.

It is highly important to you and to the Society to be certain that our master file indicates your current mailing address, business or professional-affiliation address, and interests in up to three Professional Divisions.

Please complete the form, being sure to check whether you wish mail sent to your residence or office address, and mail it to ASME, 29 West 39th Street, New York 18, New York.

Please Print

ASME Master-File Information

Date

LAST NAME FIRST NAME MIDDLE NAME

POSITION TITLE NATURE OF WORK DONE

e.g., Design Engineer, Supt. of Construction, Manager in Charge of Sales, etc.

NAME OF EMPLOYER (Give name in full) Division, if any

* ☐

EMPLOYER'S ADDRESS City Zone State

ACTIVITY, PRODUCT, or SERVICE OF EMPLOYER; e.g. Turbine Mfrs., Management Consultants, Oil Refinery Contractors, Mfr's. Representative, etc.

* ☐

HOME ADDRESS City Zone State

☐

PRIOR HOME ADDRESS City Zone State

* CHECK "FOR MAIL" ADDRESS

I subscribe to

Address changes effective when received prior to:

☐ Mechanical Engineering	10th of preceding month
☐ Transactions of the ASME	20th of preceding month
☐ *Journal of Applied Mechanics*	20th of preceding month
☐ *Applied Mechanics Reviews*	1st of preceding month

Professional Divisions in which I am interested (no more than *three*) are marked X.

☐ A—Aviation	☐ J—Metals Engineering	☐ S—Power
☐ B—Applied Mechanics	☐ K—Heat Transfer	☐ T—Textile
☐ C—Management	☐ L—Process Industries	☐ U—Maintenance and Plant Engineering
☐ D—Materials Handling	☐ M—Production Engineering	☐ V—Gas Turbine Power
☐ E—Oil and Gas Power	☐ N—Machine Design	☐ W—Wood Industries
☐ F—Fuels	☐ O—Lubrication	☐ Y—Rubber and Plastics
☐ G—Safety	☐ P—Petroleum	☐ Z—Instruments and Regulators
☐ H—Hydraulics	☐ Q—Nuclear Engineering	
	☐ R—Railroad	

cation, conveyers, and materials-handling equipment. $10,000–$12,000. (*b*) Manager of methods and standards, 35–40, mechanical or industrial-engineering graduate, at least ten years' methods and standards manufacturing experience covering heavy steel products. $9000–$10,000. Northern N. J. W-5620.

Process Engineer, 25–35, graduate mechanical engineer, at least three years' experience in work dealing with design, production of, and placing into operation of special process equipment. Will also be used for process development work. Should be capable of customer contact service. Some experience in the plastics industry, particularly the extrusion of sheet and formed shapes, desired but not a prerequisite. To start $6600–$7800. Ind. W-5622.

Boiler-Plant Design Engineer, under 45, graduate mechanical, experience in design and layout of industrial boiler plants, including coal and ash handling and economic evaluation of fuels. $8000–$10,000. Washington, D. C. W-5630.

Executive Director, to carry out public relations and administrative duties for an engineering society. Engineering background preferred. Salary open depending upon qualifications. Midwest. W-5632.

Engineers. (*a*) Chief production engineer, 35–45, preferably graduate mechanical or industrial engineer, strong, practical shop background. Journeyman machinist or diemaker. Several years' experience in direct supervision of engineering or production personnel. At least five years' experience in production or industrial engineering in the areas of process, plant, tool and die, or methods engineering. Will supervise production-engineering section of production department. (*b*) Senior development engineers, degree in mechanical engineering, about eight to 12 years' experience. Must have thorough knowledge of shop practices in light metalworking industry. Typical processes: heat-treat, punch press, cold heading, thread rolling, general machine shop. Must be competent as designer of such items as mechanical linkages, portable hand tools, firearms, fasteners, etc. Will be responsible for the engineering of a product line. Salaries open. Pacific Northwest. W-5634.

Engineers. (*a*) Electrical engineer, PhD required; prefer man with training and experience in several fields, including small controls, sonics, ultrasonics, and electronics. To $12,000 a year plus bonus. (*b*) Mechanical engineer, PhD required; preferably experience in several fields, including thermodynamics, mechanisms, hydraulics, and vibration studies. Up to $12,000, plus bonus. (*c*) Mechanical engineer, PhD required; prefer man specialized in fluid mechanics. Should have knowledge of hydraulic cyclones, centrifuges, and circulating pumps. Familiar with air-circulation problems and fan and impeller design. Some administrative ability. Up to $12,000, plus bonus. Mich. W-5639.

Engineers. (*a*) Food technologist, PhD in Food Technology or related science or equivalent training. Will assist in research and management of food preparation and preservation program. $7500–$10,000, plus bonus. (*b*) Associate research engineer for laboratory work, BSME or BSEE, plus five years' experience in refrigeration-test work or allied fields. Must be able to design tests, analyze data, determine whether results correlate with theory, etc. Up to $10,000, plus bonus. (*c*) Associate research engineer, BSME preferred, training and experience in noise-abatement controls to aid in development of quieter appliances. Up to $10,000, plus bonus. (*d*) Mechanical engineer, graduate, experience in air-conditioning design work. $6000–$8400, plus bonus. Mich. W-5641.

Engineers. (*a*) Tool engineer, experienced in tool and die design of small, intricate parts, using the progressive slide and transfer-type or dies. Must be able to carry project from an idea to a producing tool. $5400–$8580. (*b*) Designer to work on development and improvement of specialized automatic and semi-automatic machinery, small precision tools and dies. Observe long life of parts, low cost of manufacture, interchangeability of parts, and other criteria of good design. To $7620 to start. Pa. W-5643.

Maintenance Engineer, mechanical graduate at least five years' installation and maintenance experience in commercial buildings covering heating, plumbing, air conditioning, and general building alteration work. $7500–$10,000. New York, N. Y. W-5647.

Design Engineer, graduate mechanical or equivalent, experience in heavy structural equipment. Should have or be qualified to obtain professional engineer's license in mechanical engineering. Knowledge of theoretical mechanics and structures is essential. Experience in design of heavy processing machinery is preferred. $7000–$10,000 a year; liberal profit-sharing plan, hospitalization, etc. Company pays placement fee. Southeastern Pa. W-5648.

Mechanical Engineers, under 35, mechanical graduates, design experience on heat exchangers or pressure vessels and familiar with materials and fabricating practices regarding carbon and stainless steels for contract engineering. To start $8160. Pa. W-5649.

Quality-Control Engineers, BS in mechanical or metallurgical engineering, design and manufacturing experience covering power-plant pumps, valves, and pressure vessels. Some traveling. To $7800. Pa. W-5650

Production Superintendent, mechanical or chemical degree, minimum of five years' experience in development and production in the plastic-fabrication field. Some experience should be in reinforced laminated field. $9000, plus incentive. Mass. W-5652.

Industrial Engineers. (*a*) Project engineers, six to ten years' experience in line operating time and motion, standard hour, methods, new and revised installations, plant layout, flow process, statistics, etc. Prefer basic experience in steel, textile, or steel fabricating. Pa. (*b*) Plant industrial engineers, two to four years' experience in line operating, time and motion, standard hour with direct and indirect application and labor-cost analysis, methods, etc. Prefer men with textile background which would be standard minute experience. Salaries open. Miss., N. C., and Conn. W-5662.

Engineers. (*a*) Chief engineer, ground checkout equipment, to organize, direct and control all engineering activity leading to the design of ground maintenance, test, and checkout equipment, five to ten years' experience in the field of maintenance test and checkout equipment. Must have knowledge of the general field of missile-weapon system concepts and in specific sciences or technologies inherent in their design. Will supervise section of 60 to 100 engineers. (*b*) Chief engineer, air-borne guidance, experience similar to afore-mentioned in supervisory and technical requirements but must have strong background in creative electronic design. Must be qualified to staff, organize, direct, and control all engineering activity of a section devoted to research, development, and design of air-borne guidance and special electronic systems. Salaries open. South. W-5663.

Engineering Statistician, degree in industrial engineering and graduate training in mathematical statistics, four or more years' experience in application of mathematical and statistical techniques to engineering, research, or management problems, for statistical design and analysis of research, development and plant experiments, market surveys, and quality-control plans; application of probability theory and statistical inference to production and management problems; development and promotion of mathematical techniques. To start, $7800–$8900. Company pays placement fee. N. J. W-5671.

Applications Engineer, engineering degree or equivalent, 26–35, a minimum of four years in bearing design, development, and application. Will perform highly technical duties primarily related to the design and application of antifriction single or double-fractured rings. Will furnish engineering assistance in application of company products; direct and assist draftsmen in preparation of layouts and working drawings, etc. $7000–$9000, depending on education, experience, and potential. New England. W-5673.

Senior Mechanical Engineer, graduate, 35–45, a minimum of 15 years' experience covering standard steam-electric and industrial plant-equipment application and installation; preparation of equipment and installation specifications, general knowledge of operation and technical knowledge of plant supporting services and utility systems. $10,000–$15,000. New York City, some travel. W-5674.

Engineers. (*a*) Laboratory mechanical engineer, preferably graduate mechanical or equivalent, broad experience in the operation of large and high-speed mechanical equipment, to assist in the supervision of the operation and maintenance of all capital mechanical equipment in a gas-turbine laboratory. Establish and carry out preventative maintenance; supervise maintenance work; design and supervise installation of any mechanical changes or additions of capital nature. $6000–$7800. (*b*) Job analyst, considerable experience in evaluating machine-tool jobs such as lathe, milling, and grinding-machine operations based on the National Metal Trades Association method of job evaluation. Will analyze and evaluate all types of positions both hourly and salaries; prepare job descriptions. $6600–$7500. Long Island, N. Y. W-5679.

Production Engineer, 30 and over, BSME or EE, at least five years' experience. Working knowledge of quality control, mechanical, electrical, and chemical principles for the engineering of company products to meet requirements as to cost and quality, and for the maintenance of company manufacturing policies. About $7000. Westchester County, N. Y. W-5681 (*a*).

Production Engineer, 25–32, for process engineering, quality control, and efficiency studies. Training in engineering aspects of process machinery. Some experience in process engineering desirable but not mandatory. $6000–$7200. Southern N. J. W-5682.

Mechanical Engineer, mechanical or electrical, 30–55; three years' experience with architects or consulting engineers; must know mechanical engineering for buildings. To design, work drawings, and specifications for heating, ventilating, plumbing, and air conditioning for office buildings, commercial, institutional, including schools, hospitals, etc.; minimum travel; no car required. $7000–$10,000. Employer will pay fee. Neb. C-6608.

CANDIDATES FOR MEMBERSHIP AND TRANSFER IN ASME

THE application of each of the candidates listed below is to be voted on after Jan. 24, 1958, provided no objection thereto is made before that date and provided satisfactory replies have been received from the required number of references. Any member who has either comments or objections should write to the Secretary of The American Society of Mechanical Engineers immediately.

New Applications and • Transfers

Alabama

HAM, VICTOR H., Mobile
POWELL, FRED B., Decatur

Arizonia

BLEVATORSKI, EDWARD A., Tucson
• FARLEY, ORVILLE B., Phoenix
JAEGER, WALTER S., Phoenix

Arkansas

CLEMMONS, CHARLES B., Pine Bluff

California

CLAY, FLOYD G., Long Beach
DEANE, DUDLEY, San Francisco
HUBALEK, VLAD F., Oakland
KING, LEWIS C., Anaheim
KRUZAN, HAROLD F., Alhambra
LUYKX, JULIAN D., Los Angeles
OCHSNER, JOHN G., Oakland
SCALES, BRIAN T., Sharp Park
WOLFE, CHARLES H., San Gabriel

Colorado

CHRISTOPHER, ROBERT A., Boulder
DUNHAM, CHARLES H., Denver
HOLDREDGE, RUSSELL M., Boulder
KALEY, ROBERT R., Denver

Connecticut

BOWEN, ALBERT E., JR., Old Greenwich
KILLION, BERNARD L., Windsor
KLEBAN, BERNARD, Meriden
LEAK, PAUL W., Stamford
• LINGENFELTER, CARL D., Manchester
MARLEY, PAUL J., Manchester
MIGDAL, DAVID, East Hartford
WELNA, HENRY, Kensington
WERNER, RICHARD P., West Hartford
WUNSCH, WILLIAM F., Middletown

Delaware

• ST. CLAIR, DAVID W., Wilmington

District of Columbia

HULL, WILSON E., Washington

Florida

BOOKER, TROY M., Pensacola
HACKMAN, RICHARD L., Keystone Heights
LOKEY, BURKE P., Cantonment

(*ASME News continued on page 148*)

WELBOND®

is the valve

for high pressures

for high temperatures

Welbond Valves are winning acceptance among modern steam plants for all high pressure, high temperature valve service.

Superheater vents and drains, water wall drains, water column emergency shut-off, strainer blow-off, economizer drains—are just a few places where Yarway Welbond Valves are proving their mettle.

These special Welbond features insure improved valve performance:

- **Stem** of 321 stainless steel, used with special **packing** to prevent stem corrosion
- Easy and quick **accessibility.** All working parts removable through yoke. Jack action of stem forces out old packing
- Non-distorting, thermally-compensated **seat**
- Ventilated, easy grip **handwheel**
- **Streamlined flow** through body

For full information, ask your Yarway man or write for Bulletin B-452.

YARNALL-WARING COMPANY
108 Mermaid Avenue, Philadelphia 18, Pa.
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Yarway Welbond Valves are available in nine sizes, ¼" to 2½", angle and straightway designs. Pressures to 2500 psi, temperatures to 1050° F.

YARWAY **WELBOND** *. . . a good way to specify high pressure/high temperature valves*

Newhouse, Roland B., Gulf Breeze
Rohrman, Frederick A., Panama City

Georgia

Ammons, Harold A., Atlanta
• Matthews, Samuel J., 3rd, Atlanta

Illinois

Chiaro, Edward F., Chicago
Donald, John A., Highland Park
Holzbock, Werner G., Chicago
Knapp, Kenneth E., Chicago
Kurtz, James L., Riverside
Miller, David, Lemont
Mulcahy, Harry W., Chicago
• Nolan, Thomas E., Chicago
Schmidt, Robert, Champaign
Stevenson, Richard H., Elmhurst
Turner, Robert M., Kewanee
Villiers, Walter H., Jr., Chicago
Wellington, Robert H., Chicago
Wilson, George P., Decatur
Wilson, Kenneth D., Moline
Wintermoyer, Earl M., Evergreen Park
Wittenstrom, Peter A., Chicago

Indiana

• Moore, Stanley M., Kokomo
Rohrbach, George E., South Bend

Iowa

Hafling, Elmer R., Fort Madison
• Quayle, George T., Jr., Muscatine
Wenstrand, Lynn D., Council Bluffs

Kansas

• Salter, Thomas B., Wichita

Louisiana

Powell, Richard O., New Orleans
Walton, Albert G., Jr., Shreveport

Maryland

Geikler, John A., Jr., Baltimore
Groscup, Richard C., Bel Air
Heintz, Alden R., Frederick

Massachusetts

• Bock, Albert A. E., Worcester
Dannenberg, Warren B., Boston
Fignbaum, Ernest K., Jr., Burlington
Gaberson, Howard A., Wayland
Goodoak, Robert D., Reading
Hartz, Fred H., Framingham
Karlson, Ross S., Barre
Little, Henry, Cambridge
Smith, Arthur W., Wareham

Michigan

Dewhurst, Robert D., Saginaw
Edwards, Joseph A., Jr., Detroit
Methot, Douglas A., Trenton
Probe, Donald G., Detroit

Minnesota

Edeskuty, Joseph V., Minneapolis
Feng, Tsun-Ying, St. Paul
Lemon, Glenn L., Minneapolis

Missouri

Barb, Robert W., Springfield
Peltzman, Joseph L., Kansas City

New Jersey

Daines, Geoffrey A., West Caldwell
Greco, Samuel D., Passaic
Hadeler, Theodore T., Belleville
Hendrix, Kenneth D., Springfield
Hjorth, Eugene P., Kearny
Metz, John P., Carteret
Olson, Harold B., Rutherford
• Peterson, Howard S., Glen Rock
Torres, Augustin, Closter

New York

Banker, Charles R., Lindenhurst
Benedict, Harry J., Riverhead
Bonin, George E., Addison
Corrado, Joseph R., Brooklyn
Coticchio, Thomas, Hicksville, L. I.
Cullison, William L., Jr., New York
Drust, Theodore J., Buffalo
Dunn, Peter H., New York
Durlester, George H., New York
Eklund, Carl O., Northport
Farrell, William M., Schenectady
Felbeck, George T., New York
Fisher, James R., Skaneateles
Heimann, Richard H., Flushing
Jaffe, Arnold V., New York
Joseph, Raymond S., Cortland
Jost, John A., Buffalo
Kaper, Ronald G., Corning
Kraft, Hans, Schenectady
Leupin, Eric E., New York
McLean, Hugh D., Ballston Lake
McMillan, Gibson E., New York
McPhail, John J., New York
Paton, Douglas, New York
Roberts, Royal N., Syracuse
Robertson, William B., Scotia
Seeley, George H., New York
Shaffer, Richard P., New York
Silverio, Mario, Wellsville
Snow, Walter A., Syracuse
Sted, Charles J., New York
Szilagyi, Bela A., New York
• Tabachnik, William D., Bayside
Thumin, Arnold D., New York
Virgile, Lucien G., Great Neck, L. I.
Weil, Kurt H., New York
Werner, Albert, Oyster Bay Cove

North Carolina

Cook, Earl R., Raleigh
Madeira, Robert D., Charlotte

North Dakota

Tuthill, William E., Cogswell

Ohio

Bishop, Earl L., Cuyahoga Falls
Caser, Richard J., Cleveland
Chappell, Robert E., Lancaster
Clark, John E., Lancaster
Creus, Teodosio P., Barberton
Edie, William E., Massillon
Fejer, Andrew A., Toledo
Lusher, Kenneth G., Perrysburg
Orcutt, Frederic K., Columbus
Simmons, Allen N., Fostoria
Steel, Donald W., Cleveland
Thompson, Harold A., Lyndhurst
Welch, John F., Sandusky

Oregon

Kennedy, Frederick, Portland

Pennsylvania

Bigelis, Frank L., Lake City
Bridges, Donald A., Bradford
Busch, Joseph S., Pittsburgh
Drescher, George W., York
Green, Stanley J., Pittsburgh
Jones, Donald R., Norristown
• Kempf, Walter R., Lancaster
Lanyi, Ernest S., Clairton
Lovett, Donald S., N. Charleroi
Ludwig, Richard, Philadelphia
Madara, John M., Philadelphia
Miller, Robert A., Jeannette
Misner, Charles P., York
Noll, Clifford L., Philadelphia
Pehrson, Arthur G., Erie
Roselle, Donald O., Springfield
Russell, James H., Strafford
Tuba, Istvan, McKeesport
Wepper, William M., Cheswick

Rhode Island

Stravato, Gaetano, Providence

Tennessee

• Cox, Jack Clayton, Oak Ridge
Smith, Warren J., Memphis

Texas

Curry, Donald L., Freeport
Hornsby, Edgar S., Houston
Hui, Sui K., Houston
Hurst, John E., Channelview
Pittenger, James E., Genoa
• Walker, Kenneth J., Houston
• Long, Clarence H., Blacksbury
Strawn, Oliver P., Jr., Blacksbury

Washington

Case, Edward T., Spokane
Hill, Allan S., Seattle
• Merckx, Kenneth R., Richland
Shoemaker, Edward M., Seattle

West Virginia

• Lunsford, Harold D., Huntington

Wisconsin

• Dixon, John K., Milwaukee
Geiger, Richard D., Milwaukee
Riedel, Kurt A., Milwaukee
Seim, Edward S., Wausau
Swacina, Howard G., Beloit

Foreign

Byford, Allan N., Harrow, Middlesex, England
Dewers, Alfred C., Scarboro, Ont., Canada
Febres-Cordero, Leon F., Guayaquil, Ecuador
Jain, Devendra K., Punjab, India
Khan, Muhammad F., Murree, Pakistan
Mathewson, Philip L., Montreal, Que., Canada
Mendez, Joseph A., Rio Piedras, Puerto Rico
• Mettler, Albert J., Jr., Honolulu, T. H.
Mitchell, Colin M., Calgary, Alta., Canada
Robertson, Donald M., Sydney, Australia
Santos, Dante G., Quezon City, Philippines

OBITUARIES

Gustave A. Anderson (1891–1957), retired, International Handkerchief Co., New York, N. Y., died May 19, 1957. Born, Brooklyn, N. Y., Aug. 11, 1891. Parents, Arnold and Sophia (Steinfeld) Anderson. Education, Cooper Union and Polytechnic Institute of Brooklyn. Married Eugenia Schneider, 1921; one daughter, Miriam Janice Anderson. Assoc-Mem. ASME, 1920; Mem. ASME, 1935. Survived by his widow.

L. Garfield Bayrer (1882–1957), retired general manager, The Atwater Manufacturing Co., Plantsville, Conn., died Oct. 2, 1957. Born, Southington, Conn., April 17, 1882. Parents, William Joseph and Elizabeth (Smith) Bayrer. Education, attended high school. Married Hazel Brown Munn, 1922. Mem. ASME, 1918. Mr. Bayrer had for 20 years been works manager of the Blakeslee Forging Co., Plantsville, Conn. Survived by his widow.

Roy Edgar Brakeman (1880–1957), consulting engineer, Republic Steel Corp., Gadsden, Ala., died Sept. 15, 1957. Born, Wichita, Kans., Oct. 12, 1880. Parents, Hiram S. and Alice Brakeman. Education, studied at Ohio State University and ICS. Married Willie A. Williford, 1916. Mem. ASME, 1911. Mr. Brakeman was the author of several articles on steel work. He had been a specialist in steel-mill and furnace design and layout. He served the Society on several committees and in 1912 was president of the Birmingham Section ASME. Survived by his widow; a son, Roy, Jr., San Francisco, Calif.; and a daughter, Mrs. Claborne Stewart.

Albert Brown (1888–1957), combustion engineer, Republic Steel Corp., Warren, Ohio, died Sept. 5, 1957. Born, Sistersville, W. Va., Nov. 9, 1888. Education, Ohio State University, 1911. Assoc-Mem. ASME, 1922; Mem. ASME, 1935. Mr. Brown had been a specialist in blast furnace and steel plant work.

Carl Frederick Dietz (1880–1957), internationally known mechanical engineer and industrial executive, chairman of the board, Lamson Corp. of Delaware, Syracuse, and New York, died Oct. 4, 1957, at his home in Clearwater, Fla. Born, New York, N. Y., Feb. 12, 1880. Parents, Frederick A. and Caroline (Behr) Dietz. Education, ME, Stevens Institute of Technology, 1901; graduate study, Royal Technical College, Berlin, Germany; hon. DE, Stevens Institute of Technology, 1951. Married Katherine Vane, 1907. Assoc-Mem. ASME, 1903; Mem. ASME, 1910; Fellow ASME, 1949. Mr. Dietz's business activities covered almost every type of business venture. From 1937 to 1951, he had been president of a group of companies under the holding company, Lamson Corp. of Delaware, Syracuse, and New York. In 1951, he relinquished responsibilities at Syracuse and became active in the affairs of the parent company and its subsidiaries. In this capacity, he was president of the New York Mail and Newspaper Transportation Co., and president, Boston Pneumatic Transit Co. Mr. Dietz was the author of numerous articles on technical and economic subjects which have appeared in technical journals. He was co-inventor of non-slip floor tiles; and the inventor of the first type of vitamin D enriched flour. The dry treatment of lead ores was first accomplished while he was engaged in designing and operating mills for the treatment of complex ores. He organized and led an engineering expedition to South America in search of bauxite deposits. He has long been a leader in the manufacture of materials-equipment. His varied business ventures are mirrored in his many activities not only in technical societies but in civic and community affairs, reflecting his broad interest in cultural and sociological developments and activities. Mr. Dietz's services to the Society were numerous. In 1915, while vice-president and sales manager of the Norton Co., Worcester, Mass., and chairman of the War Services Committee for his industry, he was a member of the first Executive Committee, Worcester Section, ASME. During World War II, he served as a member of the War Production Committee of ASME. He had been chairman, Civic Affairs Committee, Syracuse Section ASME; Chairman, Old Guard Committee; and vice-chairman, Materials Handling Committee, ASME; and a member of the Executive Committee of the Materials Handling Division. Among his many services to the community, he was director and vice-president of the Syracuse Chamber of Commerce, a Founder Member of the Citizens Foundation of Syracuse, and a member of the N. Y. State Committee on Displaced Persons. Survived by his widow, Katherine Vane Dietz; and two daughters, Mrs. Elliott K. Reich, Bridgeport, Conn., and Mrs.

(ASME News continued on page 150)

Lawrence W. Rotan, Baltimore, Md. Honorary Mem. Pi Tau Sigma.

Lawrence Albert Dival (1901–1957?), whose death recently was made known to the Society, had been a research and development engineer, South Whitley, Ind. Born, Belleville, Ill., June 24, 1901. Son of Julius J. Dival. Education, BS(ME), Purdue University, 1926; graduate study Armour Institute of Technology. Married Mary Clark Walker, 1935. Mem. ASME, 1957. Survived by his widow.

Earl Ellsworth Eby (1886–1957), manager, General Motors Overseas Operations, New York, N. Y., died Aug. 7, 1957. Born, Dayton, Ohio, Feb. 19, 1886. Education, ME(EE), Ohio State University, 1911. Mem. ASME, 1918.

Harold Sands Falk (1883–1957), president, The Falk Corp., Milwaukee, Wis., died Oct. 7, 1957. Born, Milwaukee, Wis., Dec. 24, 1883. Parents, Louis Wahl Falk and Kitty (Sands) Falk. Education, BS, University of Wisconsin, 1906; hon. MS, Marquette University, 1930; hon. LLD, University of Wisconsin, 1948. Married Eugenia Bechtner, 1908. Mem. ASME, 1916; Fellow ASME, 1952. Mr. Falk received the John Penton Medal of the American Foundrymen's Assoc. in 1939; the War Department Certificate of Appreciation, 1946; the Navy Distinguished Public Service Award, 1955; and the Distinguished Service Award of the National Conference of Christians and Jews, 1956. Mr. Falk joined the company bearing his name in 1900. For six years he worked during summers and vacation periods and in 1906 he entered the permanent employ of the company as assistant to the superintendent. He successively held positions as vice-president, works manager, and president. Among his most important achievements is his role in the apprenticeship movement throughout the country. In addition to building an effective apprenticeship system in his own plant, he was chairman of the Apprenticeship Committee of the National Metal Trades Association in Milwaukee for ten years. He was the originator of the Milwaukee Plan of Apprentice Training. The first attempt in the gear industry to standardize and catalog a line of speed reducers was undertaken by Mr. Falk. In addition to his connection with The Falk Corp., Mr. Falk was vice-president of the Heil Co., a director of the Harnischfeger Corp., as well as a director of several other companies. Mr. Falk was the author of numerous articles on apprentice training and was a member and chairman of the Society's Committee on Education and Training for Industry. From 1930 to 1947, he had served as a member of the Board of the Milwaukee School of Vocational and Adult Education and was its president since 1934. He was an active participant in the Citizen's Military Camp movement and from 1931 to 1952 served as civilian aide to the Secretary of War of the State of Wisconsin. Survived by his widow; four sons, Harold S., Jr.; Louis W., Richard S., and Robert P., Los Angeles, Calif.; and a daughter, Mrs. B. A. Tompkins, Jr., New York, N. Y. Honorary member Pi Tau Sigma.

Hardy Ferguson (1868–1957), retired consulting engineer, Hardy S. Ferguson and Co., New York, N. Y., died July 6, 1957. Born, Chelsea, Mass., Nov. 3, 1868. Parents, George Haines and Sarah Knight (Smith) Ferguson. Education, BS, Dartmouth College, 1889; CE, Thayer School of Civil Engineering, 1891. Married Janet M. Gill, 1895. Mem. ASME, 1899; Fellow ASME, 1941. Mr. Ferguson was a specialist in the design of pulp and paper mills; hydroelectric and steam-power development; and hydraulic structures. He was a member also of the American Society of Civil Engineers and of the Engineering Institute of Canada.

Karl L. Finley (1908–1957?), whose death recently was made known to the Society, had been an administrative engineer, The F. E. Myers and Brother Co., Ashland, Ohio. Born, Ashland, Ohio, April 19, 1908. Education, studied architecture, two years, Bradley University, 1928; Villanova College, 1932. Mem. ASME, 1954. Mr. Finley held many patents in his field of interest which was the design of reciprocating hand and power pumps, centrifugal pumps, and ejector pumps.

Fritz Edmund Florschutz (1902–1957), consulting engineer, Westinghouse Electric Corp., East Pittsburgh, Pa., died Sept. 11, 1957. Born, Coburg-Bertelsdorf, Germany, May 12, 1902. Parents, Julius and Regina Florschutz. Education, Technische Hildburghausen, 1922; BA, Carnegie Institute of Technology, 1931. Naturalized U. S. citizen, 1930, Pittsburgh, Pa. Married Reinhilde Seifert, 1930. Mem. ASME, 1944.

Joseph Herbert Fox (1870–1957?), whose death recently has been made known to the Society, had been a retired executive engineer with Pittsburgh Plate Glass Co., Pittsburgh, Pa. Born, Lucas, Ohio, Sept. 20, 1870. Parents, Herman and Sarah Adilard (Mowers) Fox. Education, ME, Ohio State University, 1897. Mem. ASME, 1904; Fellow ASME, 1948. Mr. Fox held over 40 patents covering not only mechanical devices but a variety of subjects including glass blocks and cellular glass. Mr. Fox's outstanding contribution to the glass industry was the development of the modern process for continuous melting, rolling, grinding, and polishing of plate glass. Mr. Fox had been a member of the Pittsburgh Chamber of Commerce.

Joseph Parker Gazzman (1861–1957?), whose death recently was made known to the Society, has been a retired mining engineer, St. Louis, Mo. Born, St. Louis, Mo., Jan. 26, 1861. Parents, James Breading and Louisa Morris (Blaine) Gazzman. Education, Washington University, 1884. Married Louise Logan Tompkins, 1905. Mem. ASME, 1902.

Harry F. Halladay (1879–1956?), whose death recently was made known to the Society, had been general mechanical engineer with The New York Air Brake Co., Watertown, N. Y. Born, Depauville, N. Y., Oct. 31, 1879. Parents, Reuben and Olive A. Halladay. Education, BS(ME), Clarkson College, 1902. Married Elizabet Clarke, 1912; one son, William B. Halladay. Assoc-Mem. ASME, 1903; Mem. ASME, 1913.

Russell William Hargrave (1872–1957), consulting engineer, Poughkeepsie, N. Y., died Feb. 27, 1957. Born, Pleasanton, Kans., Aug. 6, 1872. Parents, Alex R. and Maria Fanny (Underwood) Hargrave. Education, Rollins College; BS(ME), University of Wisconsin, 1898. Married Bertelle Smith, 1916. Assoc-Mem. ASME, 1899; Mem. ASME, 1914. Mr. Hargrave began his career as a teacher. He was an instructor in shop practice at the University of Wisconsin; instructor in machine design at the University of Michigan; and professor and head of the department of electrical engineering at the Georgia School of Technology. He later held positions in industry and in 1936 took charge of his own consulting practice. Registered engineer in the State of New York, 1941. Survived by his widow; two daughters, Mrs. Dorothy Farris, Framingham, Mass., and Mrs. Bertelle Mills, Utica, N. Y.; and two sons, Russell W., Jr., and Robert A. Hargrave.

Isaac Harter (1880–1957), consultant and former vice-president, Babcock & Wilcox Co., New York, N. Y., died Aug. 22, 1957. Born, Mansfield, Ohio, Jan. 3, 1880. Parents, Michael Daniel and Mary Lucinda (Brown) Harter. Education, BS, University of Pennsylvania, 1901. Married Elizabeth Farrington, 1904 (died 1955); one son, Isaac Harter, Jr. Married 2nd Alice Crane Howland, 1956. Assoc-Mem. ASME, 1908; Mem. ASME, 1921; Fellow ASME, 1950. Mr. Harter had been associated with the Babcock & Wilcox predecessor and subsidiary companies for more than 50 years. His career began with the Aultman-Taylor Machinery Co., Mansfield, Ohio, which later became part of Babcock & Wilcox. He became a director of both Babcock & Wilcox and the Babcock & Wilcox Tube Co., now the Tubular Products Division. In 1947, he became chairman of the board of the tube company, a position which he held until his retirement in 1951 when he became a consultant to the company. He was also a director of the Vitro Corporation of America. Active in the development of the ASME Boiler Code and the enactment of uniform state boiler laws, Mr. Harter held a number of patents for boiler design, industrial furnaces, refractories, continuous casting and steel making machinery. In 1951, Mr. Harter was the second person to receive the Newcomen Medal for achievement in the field of steam. He was a member of the Industrial Advisory Committee, Atomic Energy Commission and served on the commission's patents compensation board. Survived by his widow, Mrs. Alice Crane Howland Harter, and a son, Isaac Jr.

Charles Couch James (1882–1957), management counselor, New York, N. Y., died Sept. 30, 1957. Born, Lincoln, Ill., Nov. 24, 1882. Education, high-school graduate. Affiliate ASME, 1949. The author of many articles on management and accounting, Mr. James had often lectured at Columbia and New York Universities and at Pennsylvania State College. He was a delegate to the Eighth International Management Congress at Stockholm. Surviving are his widow, Mrs. Blanche M. James; two sons, Leonard G. and Norman James; and a daughter, Louise M. James.

Conrad Jobst (1889–1957), administrative research consultant, Kimble Glass Co., Toledo, Ohio, died Sept. 1957. Born, Erlangen, Germany, Nov. 6, 1889. Attended vocational school and was an apprentice at Burstenfabrisk, Erlangen, Germany. Naturalized U. S. citizen, 1922. Mem. ASME, 1942. Held over 25 patents in the area of brush manufacturing equipment.

William Henry Johnson (1882–1957?), whose death recently was made known to the Society, had been assistant to industrial engineer, Michigan Consolidated Gas Co., Detroit, Mich. Born, Liverpool, England, May 25, 1882. Parents, Christopher and Elizabeth Isabella (Kinghorn) Johnson. Education, high-school graduate; attended Detroit City College. Married Elizabeth Kay Mac Coll, 1906; one son, William Alexander (both deceased). Assoc-Mem. ASME, 1920; Mem. ASME, 1935. Mr. Johnson a specialist in steam engineering was a registered engineer in the State of New Jersey, 1929.

Carl Augustus Kuester (1902–1957), project manager, Babcock & Wilcox Co., Barberton, Ohio, died Sept. 14, 1957. Born, Brooklyn, N. Y., Jan. 22, 1902. Education, BS(ME), Brown University, 1926. Mem. ASME, 1949. A professional engineer in the State of New York, Mr. Kuester had been a specialist in the field of steam generating and related equipment.

Howard Hoyt Maxfield (1873–1956), retired superintendent of motive power, Pennsylvania Railroad Co., Wilmington, Del., died Oct. 27, 1956. Born, Bloomfield, N. J., Oct. 27, 1873. Parents, Charles William and Ellen (Scriven) Maxfield. Education, ME, Stevens Institute of Technology, 1895. Married Mary E. Bailey, 1901; two daughters, Elinor B. and Mary E. Maxfield. Mem. ASME, 1904. In World War I, he received the Distinguished Service Medal and the French Legion of Honor.

Peter Joseph Nestler (1888–1957), vice-president, Vincent-Gilson Engineering Co., New York, N. Y., died Oct. 9, 1957. Born, Jersey City, N. J., April 26, 1888. Parents Joseph and Theresa (Lutz) Nestler. Education, ME, Stevens Institute of Technology, 1910. Assoc-Mem. ASME, 1916; Mem. ASME, 1921. Married Louise Willett Morrell, 1924. Survived by his widow, and one daughter, Miss Alice Theresa Nestler, Bristol, Tenn.

Coleman Sellers, III (1893–1957), partner in The Sellers Co., Ardmore, Pa., died Sept. 1, 1957. Born, Philadelphia, Pa., Feb. 13, 1893. Parents, Coleman and Helen G. (Jackson) Sellers. Education, BS(ME), University of Pennsylvania, 1915; ME, 1928. Married Kathlyne M. Shattuck, 1916. Mem. ASME, 1928. Mr. Sellers had been the author of numerous articles published in technical journals. He had for many years been an active member of the Society on a local and national level. He served as a member of the Publications Committee, the Special Research Committee on Cutting Metals, and as a member of the Executive Committee of the Machine Shop Practice Division. On the local level, he was a chairman of the Philadelphia Section, chairman of various committees including the Upgrading Committee, and a member of the Executive Committee and the Scanning Committee. He was a member also of the Franklin Institute and served as its vice-president. Survived by his widow and four children, Coleman, IV, Frank R. S., William W., and Kathlyne J. Sellers.

Joseph Henry Shaw (1889–1957), retired inspection engineer, E. I. du Pont de Nemours and Co., Wilmington, Del., died Sept. 20, 1957. Born, Wilmington, Del., Feb. 25, 1889. Education, ME, Cornell University, 1912. Assoc-Mem. ASME, 1914; Mem. ASME, 1943. A specialist in the field of industrial power, Mr. Shaw was a registered engineer in the State of Delaware.

Claude Sintz (1876–1955), Claude Sintz, Inc., Detroit, Mich., died July 14, 1955. Born, Springfield, Ohio, Dec. 7, 1876. Education, high-school graduate; attended Wittenberg College. Mem. ASME, 1917.

Abraham Solov (1905–1957), consulting engineer, Burns and Roe, Inc., New York, N. Y., died Sept. 21, 1957. Born, Bialistok, Grodno, Russia, Aug. 13, 1905. Parents, David and Pauline Solov. Education, BS(ME), Cooper Union, 1932; post-graduate study at New York University. Married Mary Streisand, 1931. Jun. ASME, 1932; Mem. ASME, 1944. Survived by his widow.

Henry Martsolf Wilson (1872–1957), retired sales engineer, The James H. Herron Co., Cleveland, Ohio, died Aug. 30, 1957. Born, New Brighton, Pa., Aug. 13, 1872. Parents, Thomas S. and Emma (Martsolf) Wilson. Education, ME, University of Pittsburgh, 1895. Married Juvia Johnson, 1912; one daughter, Virginia. Mem. ASME, 1941. Mr. Wilson served the Society as a member of the Executive, Membership, Re-employment, and Nominating Committees. Survived by his widow, Mrs. H. M. Wilson, Elizabethtown, Pa.; and a daughter, Mrs. Edward William Simon, Maple Heights, Ohio.

Charles Esters Wood (1891–1957), assistant to the president, Linkenheimer Co., Cincinnati, Ohio, died Oct. 1, 1957. Born, Wyoming, Ohio, May 30, 1891. Parents, Charles and Ruth (Cowing) Wood. Education, University of Cincinnati, 1915. Married Anne Owens, 1919. Assoc-Mem. ASME, 1916; Mem. ASME, 1923. Early in his career, Mr. Wood had been instructor of metallurgy and later in charge of all metallurgical courses at the University of Pittsburgh. During World War I, he served overseas as a chemical liaison officer. Survived by his widow, Mrs. C. E. Wood.

An Exclusive Design for Industrial Applications...

WESTINGHOUSE INDUSTRIAL UNIT HEATERS

HEATING COILS — Two types: Heavy Duty (shown above) with extra heavy wrought iron finned pipe for high pressure systems or process work. General Purpose, with non-freeze, non-ferrous heating coils.

FAN ASSEMBLY—Centrifugal pressure multi-blade, die-formed type. Self-aligning, grease-lubricated ball bearings are mounted outside the casing for easy maintenance.

ONE WARRANTY — Westinghouse makes every component— COILS, FANS, MOTORS. One supplier responsibility for quick service.

Fourteen basic coil sizes are available to give you optimum (most favorable selection) for either steam or hot water; up to 200 PSIG from 100,000 to 4,000,000 BTU/hr; air capacity for effective circulation, 2,000 to 34,000 CFM.

Sturdy casings, heavy-duty bearings and Westinghouse proven-plate fin-coil construction and performance give you a product to meet your most exacting application requirements.

You can't buy more rugged *quality* and *versatility* than is built into the Westinghouse line of unit heaters, designed *exclusively* for industrial applications.

Further, compact Westinghouse units can be mounted on the floor, wall or ceiling, can be relocated to accommodate changes in plant layout. And every unit is backed by a Westinghouse exclusive—*one warranty*—for engineering assistance and single equipment responsibility.

Next time you buy or specify Industrial Unit Heaters, call your Sturtevant Division Sales Engineer. For your copy of Industrial Heater Catalog 1510-2, call him now or write Westinghouse Electric Corporation, Dept. A-3, Hyde Park, Boston 36, Massachusetts.

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YOU PAY NO MORE for the extra quality you see in every part of a Jenkins Outside Screw & Yoke U-Bolt Gate valve. Yet longer life and reduced maintenance is bound to result from the extra ruggedness, the precision manufacture and unique design features which Jenkins puts into these popular, general utility valves.

Choose the Outside Screw & Yoke pattern for services where spindle threads must be kept out of the destructive effects of fluids in the line; where spindle threads must be cleaned and lubricated regularly or where a rising spindle is needed to indicate wedge position.

Choose JENKINS, whether O.S. & Y. or Inside Screw pattern, for valves built to save maintenance dollars.

WIDE RANGE OF JENKINS U-BOLT GATES

GET FOLDER NO. 207 which describes Inside Screw and O.S. & Y. patterns . . . Iron Body with Bronze or Stainless Steel Mounting . . . All-Iron and Ni-Resist with type 316 Stainless Steel trim. Ask your local Jenkins Distributor or write Jenkins Bros., 100 Park Avenue, New York 17.

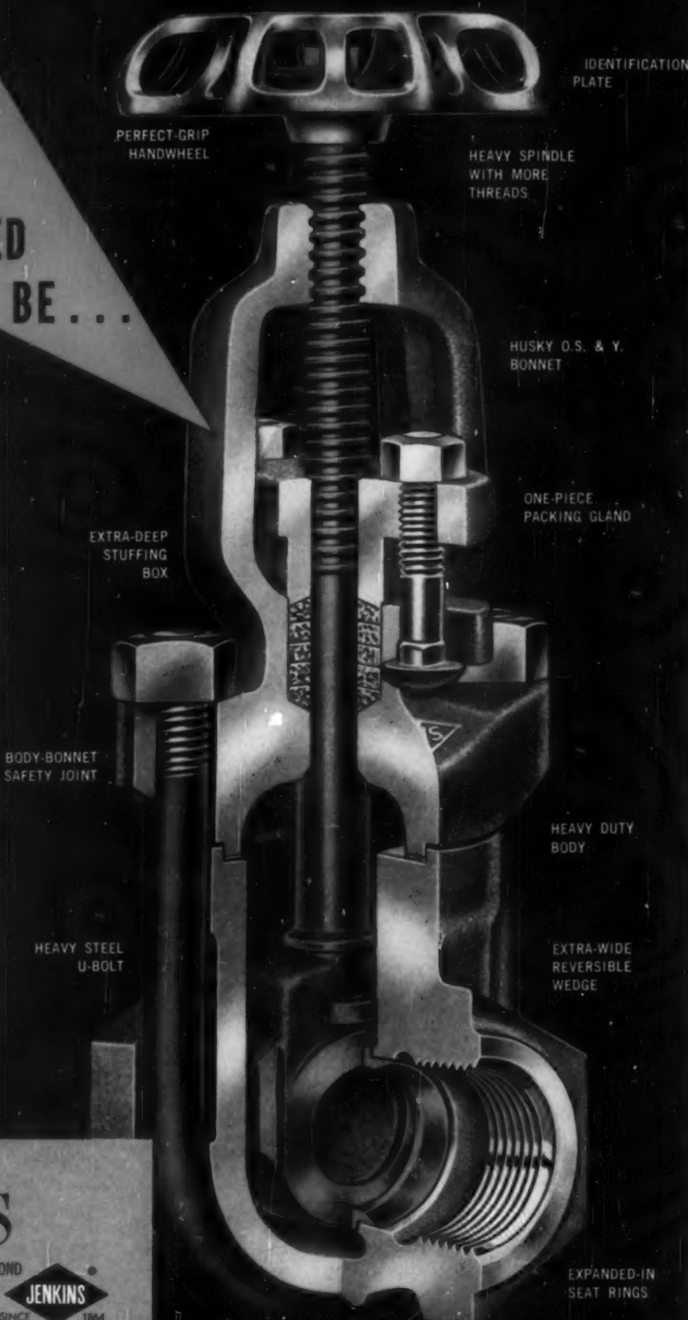

Fig. 242
Iron Body, Bronze Mounted

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864
Jenkins Bros

Sold Through Leading Distributors Everywhere

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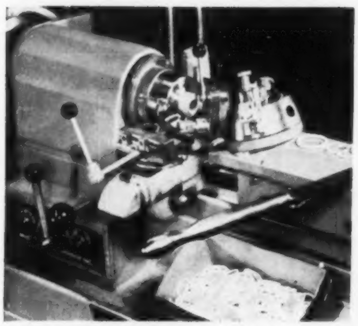
NEW EQUIPMENT



Spindle Feeds Extra-Size Stock

To reduce stock preparation and speed production of plastic O-rings, Crane Packing Co., Morton Grove, Ill., eliminates pre-cutting to length and chucking plastic bar stock by using a Rivett 918 Cabinet Turret Lathe with a $2\frac{1}{2}$ in. capacity spindle. This extra large size permits feeding bar stock in length up to 20 ft directly through the spindle. In addition, by using adapters with a Sjogren chuck on the Rivett lathe, stock sizes down to $\frac{3}{4}$" can be used. The large capacity spindle is another feature of the Rivett lathe which enables Crane Packing to do a variety of jobs on a low-cost production basis.
—KI-1

Triple Discharge Pump

Ruthman Machinery Co., Cincinnati 2, Ohio, announces its recently developed outside flange mounted pump, Model 5S-4520.

This model has three discharges, one on the right side, one on the left side of the housing, and one, optionally tapped, through the inlet port of the mounting flange. The discharges may be used individually, in pairs or simultaneously, the firm reports.

The unit is available with either 1/10 hp. 3450 rpm or 1725 rpm motor and in $\frac{1}{4}$ hp at 3450 rpm, equipped with self-adjusting pretested seal. Maximum overall height of the $\frac{1}{4}$ hp size is $13\frac{3}{16}$ in. and the $\frac{1}{10}$ hp size is $11\frac{7}{16}$ in.

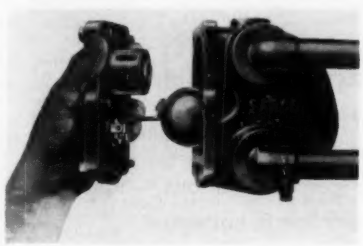
Various diameter impellers are available for capacities up to 30 gpm and heads up to 27 ft. —KI-2

Silicone Compounds

Two new compounds, said to be the first to make possible the production of silicone rubber sponge components to close tolerances, have been added to the standard product line of the Silicone Products Dept., General Electric Co., Waterford, N. Y. They are designated SE-546 and SE-547, and meet the requirements of the new AMS specifications for silicone sponge, the company reports.

The firm says these are the first compounds to be designed specifically for the production of silicone sponge, and that both are usable at temperatures ranging from −120 to +500 F. They are said to greatly surpass organic sponges in their resistance to ozone and weathering and to have superior vibration damping and compression set properties as well.

SE-546 meets the requirements of AMS 3196 for firm, closed cell sponge; SE-547 the requirements of AMS 3195 for medium, closed cell sponge. Both compounds form uniform, unicellular sponge and can be made in a wide variety of shapes whether extruded for free expansion or mold expansion, or molded and cured in a single operation, the company states. —KI-3

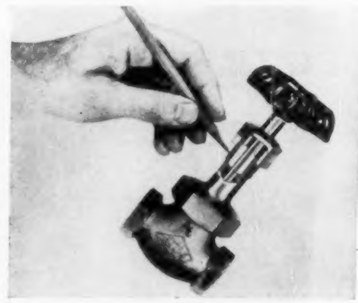


Thermostat Steam Trap

Sarco Co., Inc., 350 Fifth Ave., New York 1, announces a float-thermostatic steam trap, type FT.

The entire operating element of the new trap is one unit, which can be removed without disturbing inlet and outlet connection to the semi-steel trap body, suitable for 125 psi steam pressure. Operating elements consist of stainless steel valve mechanism, copper float, and bronze thermostatic air vent.

The valve is designed to provide condensate seal and prevent loss of steam. It discharges condensate at steam temperature continuously and without shock. Separate air vent, requiring no adjustment when pressure changes, removes all air and incondensable gases, allowing no steam to escape, the firm says. —KI-4



Valve Stem Packing

Garlock Packing Co., Palmyra, N. Y., has introduced a virtually universal valve stem packing for medium temperature service.

The new packing material, designated Style 5022, is a molded type valve stem packing ring made from copper wire inserted asbestos yarns which are braided and impregnated with Teflon suspensoid and die formed into rings.

The firm says the Teflon gives the packing unique characteristics and extreme versatility. It is said to be dense and firm, will not allow seepage and can withstand a great deal of physical abuse. Teflon acts as the lubricant and is serviceable at temperatures up to 500 F. It is said to exhibit low flow under high pressure. —KI-5

Milling Machine Unit

A new packaged unit designed to replace the bronze bushing in the outer support of horizontal milling machines, without special machining or installation, is announced by Donley Products, Inc., 11106 Avon Ave., Cleveland 5, Ohio.

The unit is said to eliminate the problem of constant bushing wear and maintenance and to hold precision indefinitely at greatly increased speeds and feeds to take full advantage of carbide cutters. The company claims the new support units increase cutter life and eliminate cutter breakage, twisted arbors, frozen bushings, and chatter. Running at low temperatures, these units eliminate tolerance requirements for heat expansion, the firm claims.

The new horizontal milling machine outer support unit is described as a cool operating, free running live bushing. Tapered roller bearings are used because of the wear adjustment principle that retains their ability to maintain concentricity. Two sets of tapered roller bearings are used to give full radial load support, the company reports. —KI-6

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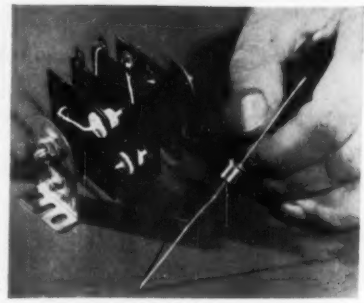

Silicon Power Rectifier

Three new silicon power rectifier diodes, Types 305, 320, and 321, are now available from the Westinghouse Electric Corp.

The new hermetically sealed silicon rectifying cells provide d-c forward currents up to 1.6 amp with a maximum peak inverse voltage up to 800 v.

Maximum forward voltage drop at 1 amp and 125 C case temperature is 1.3 v. The peak leakage current at the same case temperature will not exceed 1.5 ma. Maximum operating frequency is 50 kc. Operating junction temperature is 175 C.

The rectifier case is the positive, cathode, terminal. Type 305 has a stud base for through mounting; Type 320 has a pigtail base and Type 321 has a plain base without the pigtail.

All three cells are also available in complete rectifier bridge assemblies. —KI-7

Vapor Condenser

Niagara Blower Co., 405 Lexington Ave., New York 17, announces development of a new design aero vapor condenser, using the principle of evaporative cooling with rejection outdoors of the heat of condensation.

Vapors are condensed in two parallel-mounted, water sprayed coils enclosing a central plenum under the fan section. The air stream enters above the coils, travels downward over them and enters the plenum, where it drops its entrained moisture, and passes up and out thru the fan. According to the company, the spray water is recirculated; only a small amount of it is consumed (1000 Btu per lb of water evaporated, plus a small wastage.)

Condensate is recovered by draining it into a manifold where a screening baffle tube separates out the noncondensibles. Noncondensible gases are sub-cooled by seven or eight degrees and ejected by a steam ejector or a vacuum pump. Vapor mixed with noncondensibles is condensed and returned through reflux tubes.

Condensing temperature may be low, within 20 F of the ambient wet-bulb, and a high vacuum is economically maintained, the firm states. —KI-8

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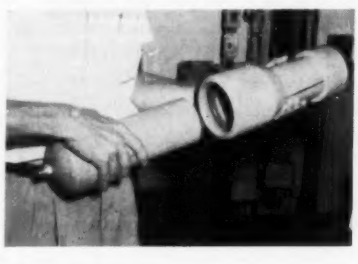
Automatic Line Oiler

A new automatic line oiler for air tools which shuts off the air supply when the oil is used-up is now being manufactured and marketed by Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wis.

The unit, designated L0380, is light in weight, easily adjusted, and refillable while in use, the company says. The positive type oil-pickup feeds oil the instant drilling starts; the moment the oil supply is exhausted, the air supply to the air tool is shut off automatically. It has a one-pint capacity.

Differential pressures are used to operate the oiler. Air is routed through the oiler to create a pressure on the inside of an oil resistant bellows; this forces a regulated amount of oil through a porting, injecting oil into the air stream at the outlet end of the oiler. When the oil chamber is empty, the bellows activates the shut-off plunger, cutting off the air supply to the air tool.

The oiler body is made of aluminum, weighs 9 lb, and is of streamlined design. It is less than a foot in length, and its top capacity is 300 cfm. —KI-9



Quick Coupling

A quick coupling that can be assembled and disassembled in seconds has been developed from high impact Koroseal polyvinyl chloride pipe produced by the plastic division of B. F. Goodrich Industrial Products Co., Marietta, Ohio.

The new coupling is recommended by the company for temporary chemical, oil, water or disposal lines.

To install, you merely push the grooved end of the pipe into the coupling until the thrust ring seats in the groove, the firm explains. To disassemble, you set a disassembly tool in place and simply pull the pipe out of the coupling.

The company says the coupling will take up to 10-deg misalignment in pipe joints. There are no exposed surfaces to protect in handling, no metal parts to rust or corrode, and no bolts or snaps to tighten or lose.

Quick coupling rigid pipe is available in 2-, 3- and 4-in. sizes in standard 20- and 30-ft lengths. The firm offers fitting adaptors, disassembly tools and replacement gaskets for use and maintenance. —KI-10

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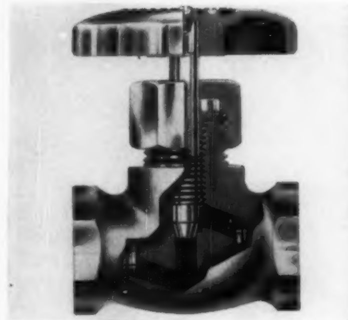

Needle Valve

A new globe type needle valve, for use as a gage or for metering service in gas, oil, water lines, or other similar uses, is announced by Kerotest Mfg. Co., Pittsburgh, Pa.

It has been developed to provide a high-quality, economical valve for applications where space is a factor and where operating areas are close, the company states. It is designed for use in meter boxes, pressure gage controls, laboratories, as sampling valves.

Designated Type N-28, the new valve features a one-piece solid forged carbon steel body with a 12/14 chromium heat-treated stainless steel stem with Teflon packing. The valve is available in sizes of $^1/_8$, $^1/_4$, $^3/_8$, and $^1/_2$ in. It has a maximum working pressure of 10,000 lb psi at 70 F, and a maximum operating temperature of 500 F. **—KI-11**

Butyl Products

Garlock Packing Co., 413 Main St., Palmyra, N. Y., has introduced its new Orange Line of butyl products manufactured exclusively for packing phosphate ester type fire-resistant fluids in dynamic applications.

The firm points out that butyl is not compatible with and is destroyed by mineral base oils. To solve the problem of differentiating between butyl and other rubbers the company has applied a broad bright orange colored strip axially across the OD.

Seven new styles of butyl packing so identified are now being marketed by the firm.

Styles 433 and 8220 have been added to the company's Chevron line and are duck reinforced butyl, said to be suitable for all phosphate ester base fire-resistant fluids. Styles 9188 (90 durometer), 8583 (80 durometer), and 9283 (70 durometer), are of homogeneous butyl, suitable in all forms against Cellulube and can be obtained in the firm's oil seals, or split Klozures, Chevron. U-cups, flanges and other molded packings.

Style 9227 is a homogeneous butyl O-ring suitable for use against Cellulube. Style 7514 is a duck reinforced butyl cone type packing. **—KI-12**

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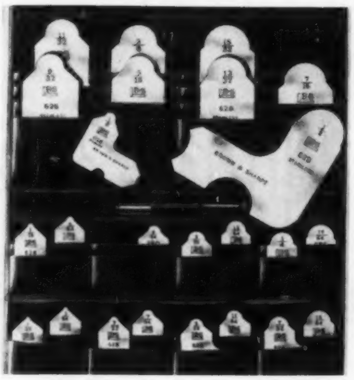

Individual Radius Gages

A series of new gages for checking radii from 1/32 to 1/2 in., has been announced by Brown & Sharpe Mfg. Co., Providence, R. I.

Each of these No. 628 radius gages has five different gaging edges, permitting testing of both convex and concave radii even when recessed, and making the testing of corner radii easy, the company says. Gages are stainless steel, furnished with an interchangeable holder which simplifies their use.

The gages are available in three sets: 1/32 to 17/64 in. by 64ths, 9/32 to 1/2 in. by 32nds, and a combined set of both ranges. Individual sizes are also available singly. **—KI–13**

Power Cylinders

A new line of squarehead hydraulic power cylinders has been announced by Anker-Holth Div., Wellman Engineering Co., 2723 Connor St., Port Huron, Mich.

The cylinders are made for service at 2000 psi, or 3000 psi in nonshock installations. All cylinders are tested out at 4500 psi before delivery, this company reports. They are made to JIC standards.

The line comes in bores from 1 1/2 through 12 in. and is available in all mountings, standardized for interchangeability.

The cylinders are double acting and can be furnished with precision-adjustment cushions at either end or both ends, without increasing length. Piston rods are of high strength steel, ground, polished and chrome plated. Steel having 125,000 psi minimum yield strength is used for the tie rods. The cylinder barrel is cold drawn seamless steel tubing honed to 10 μ-in. finish and heads are machined from cold finished steel bar stock.

The cartridge assembly is replaceable as a complete unit or the bronze rod bushing and rod packing may be replaced separately. V-type, spring preloaded rod packing is available in stock sizes and materials to suit all types of fluids. The rod wiper provided is interchangeable with standard metallic scrapers. **—KI–14**

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Footless Motor

A new Uniclosed footless motor is now being manufactured by U. S. Electrical Motors Inc., Box 2058, Terminal Annex, Los Angeles 54, Calif. Designed for direct connection to driven equipment, the new motor is supplied with a NEMA style C unimount bracket for automatic alignment. The motor is built to the latest NEMA specifications, and is available in ratings from 1 to 30 hp.

According to the company, an exclusive Ventrifoil deflector directs air and deflects water. The cast iron, one-piece frame is heat-treated to prevent warpage and is completely dripproof. Windings are asbestos protected. A cast iron, split-type conduit box for access to motor leads is supplied and may be located above, below or on either side of the motor. **—KI–15**

36-Channel Oscillograph

A 36-channel oscillograph, designed to provide the widest and most convenient use of the advanced Visicorder principleof direct-recording, has been introduced by the Heiland Div., Minneapolis-Honeywell Regulator Co., Denver, Col.

The new instrument, Model-1012 Visicorder, produces records that are immediately visible and usable, recording directly on paper that requires no processing of any kind, the company states. This technique is said to make possible an oscillograph that combines the best features of sensitive, fast-writing photographic types and the convenience of direct-writers without the disadvantages of either.

In addition to its large number of channels the new unit incorporates a number of new features, some of which, it is claimed, have never been built into an instrument of this kind. For example, grid lines may be recorded simultaneously with time lines and galvanometer traces. All speeds are changed by push-button control. The instrument features five speeds in each of three ranges—from 0.1 to 160 in. per sec. All controls are located on the face of the instrument for instant use, whether rack-or bench-mounted.

The unit has a frequency response of 3000 cps, achieved without peaked amplifiers.

Writing speed is up to 20,000 in. per sec., using 12-in. Visicorder paper. The instrument's galvanometers deflect 8 in. peak to peak. Traces may overlap—they are not limited by adjacent channels. The instrument accommodates 200 ft of record paper, which can be loaded in daylight. An indicator shows the amount of unused paper. All paper transport and take-up functions are integral.

The new Visicorder, designed for 115-v, 50, 60 or 400-cycle operation, is 16–3/4 in. wide, 17–3/4 in. high with shock mounts, and 24–1/8 in. deep. It weighs 160 lb. **—KI–16**

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Bare-Wire Panel

A new, heavy-duty, infra-red heating panel said to produce exceptionally high watts density is announced by the Syntron Co., 498 Lexington Ave., Homer City, Pa.

The firm says its flat, sinuated wire panel design exposes maximum heating surface to the application. It is made with heavy gage bare wire to produce heat much more intense than standard infra-red panels.

The unit has a stainless steel frame holding the ceramic insulator blocks and sinuated wire elements. Operation is from 115, 230, or 460 v, 3-phase a-c. **—KI-17**

Purge Sequence Valve

Announcement has been made by Atlas Valve Co., 280 South St., Newark, N.J., of a purge sequence valve designed to provide a secure and hazard-free means of steam purging or scouring oil burner tips in industrial installations.

Designated Fig. 1000, the device is a triple interlocked valve system actuated by a single handwheel. It dictates an inflexible and irreversible sequence in the control of atomizing steam, fuel oil and steam for purging the burner tips. According to the company, the cycle positively prevents the admission of oil to a hot firebox before the admission of atomizing steam, eliminating possible human error and possible boiler explosion in the manipulation of three separate valves usually required in this type of installation. **—KI-18**

Sump, Process Pumps

A new line of heavy duty vertical centrifugal pumps for sump and process service has been introduced by Goulds Pumps, Inc., Seneca Falls, N. Y.

The single and duplex units, both wet and dry type, have capacities to 1080 gpm with heads to 290 ft, for pit depths up to 20 ft. According to the company, basic design of the pumps provides custom built units through usage of standardized parts. The company says the pumping unit may be adapted in the field for changed pit depths or pump ratings by installing new and standardized parts. Vapor proof construction can be supplied on all units with all possible points of leakage of vapor or fumes, including shaft, bearing housing, cover plate, discharge pipe, grease pipes sealed, the firm states. Float rod and pit covers are drilled on periphery for gasketed joints. Special construction and materials, including 303 stainless steel shaft, carbon, rubber or carbon filled Teflon bearings, stainless steel or ceramic floats, stainless steel float rods, permit the units to handle various types of liquids, the company reports. **—KI-19**

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Rotary Car Dumper

A new rotary car dumper has been developed by Heyl & Patterson, Inc., 55 Fort Pitt Blvd., Pittsburgh 22, Pa.

The dumper, capable of handling hopper and gondola cars, is equipped with two clamps which hold the car secure without the use of counterweights. According to the company, the unit is balanced so that it can dump and return a spotted car in one minute with 30 hp drive.

Optional equipment consists of an electronic scale in the dumper platen which permits weighing and lightweighing car in the dumper, and a power operated car retarder also on the dumper platen to permit rolling cars to be spotted without use of riders.

—KI–20

Interfloor Conveyor

Development of an automatic interfloor handling system designed to convey material either up or down from any one floor to any other floor at the touch of a button is announced by Gifford-Wood Co., Hudson, N. Y.

Featuring new double-level conveyors on each floor to separate up/down transfer operations, and what is described as one of the most complete control systems of its kind, this single unit provides five different conveying cycles. A panel said to be foolproof tells the operator, by means of signal lights, where a load comes from and where it is going.

The system is centered around a vertical conveyor. Two sets of horizontal conveyors, one for loading, one for receiving, are installed at each of the floors to be served and are interlocked with the vertical conveyor. This conveyor, or gig, contains two levels of chain conveyors that work in conjunction with the two levels of floor conveyors.

The double-level conveyors on each floor completely separate upward and downward transfer operations. A load moving in the up direction is automatically transferred from the lower level conveyor on the first floor into the lower portion of the gig, vertically conveyed to the prescribed floor, and delivered to the lower level conveyor on the upper floor. Conversely, loads moving downward are handled on the upper conveyors at feed, vertical transfer and delivery points.

This, the firm explains, also enables movement of loads in both directions without having to check receiving points for clearance. The gig can deliver a load to a floor and pick up another load at that floor for travel in the opposite direction.

The 6000 lb load capacity designed into the system is claimed by the company to be two to three times greater than most interfloor systems can handle. The conveyors will handle 40 × 48 in. pallets with room for 8 in. overhang on sides. Safety devices are installed at every point in the system where a transfer mishap might occur.

—KI–21

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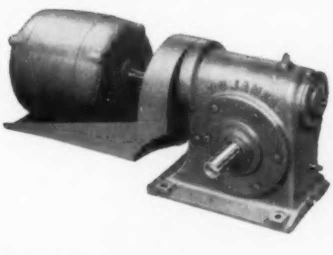

"All Motor" Motoreducers

D. O. James Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill. made available catalog for new right angle drive, type RS, from 1/3 to 30 hp, output speeds 11.5 to 310 rpm, made in 13 sizes. Also new in-line drive, type MS, 1 to 75 hp, output speeds 1.5 to 190 rpm, made in 37 sizes. Each type can be powered by standard foot-mounted NEMA motors in any make or type. May be purchased with suitable motor or you may use your own. Reasonably priced, these units offer complete accessibility with quick exchange of motors and couplings. Prompt delivery. —KI-22

Hydraulic Presses

A series of heavy duty, high velocity, hydraulic trim-presses, claimed to be the fastest acting hydraulic presses on the market, is announced by Bausenbach Hydraulics Div., Buffalo Metal Container Corp., 75 Meadow Rd., Buffalo 16, N. Y.

According to the company, the presses are designed around an exclusively new principle using an accumulator with a closed shock-free, pressurized, hydraulic system. Extremely rapid cycling action is said to be achieved with lower horsepower input.

The presses are available in platen sizes of 15 × 18 up to 36 × 54 in., offering 12, 15 and 18-in. strokes, with shut-heights of 5, 10 and 15 in., in 13, 20, 30, 40 and 50 ton capacities, in either 2 or 4 post types.

The company says parallel strain rods with heavy duty platen guide bearings, give a large, well supported working area and afford a versatility of tooling and die arrangement. All components including the motor, pump and reservoir, are mounted on the top platen. The entire area beneath, behind and on all sides is free of equipment permitting use of conveyors, chutes and other means of quickly handling parts, and the area below the platen affords room for the mounting of die cushions, the firm states. —KI-23

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Micro-Miniature Potentiometers

Ace Electronics Assoc., Inc., Somerville, Mass., has introduced a new line of micro-miniature precision wire-wound potentiometers said to offer greater stability under temperature cycling than other types of comparable size and which will dissipate 2 w at 60 C.

Called Acesets they are available in nine different resistance values between 100 and 25,000 ohms. The firm says greater temperature cycling stability is made possible through the use of 20 ppm temperature coefficient wire. Mechanical specifications include one piece precision-machined metal case, passivated stainless steel shaft, self-contained locking device, panel anti-rotation pin, mechanical rotation is 330 deg nominal. Size is $^1/_2$ in. diam × $^5/_{16}$ in. body length.

—KI–24

Electric Starter

A new electric starter for engines up to and including 4 hp with a maximum displacement of approximately 11 cu in. is announced by Fairbanks, Morse & Co., Magneto Div., Beloit, Wis. The Model 850 starter operates on direct current only and provides clockwise rotation.

The starter is powered by a 12-v battery. The charger for the battery is available as an accessory for bench operation during off-duty periods for the gasoline engine. The charger operates by being plugged into any conventional house current outlet.

Charger output is designed to be low enough to allow the operator of the power-driven device to leave the battery on charge for extended periods of time without injuring the battery, yet high enough to recharge the battery fully in 36 hr after a month's usage. Battery is rated 20 amp hr, 12 v, and is $5^3/_{16}$ × $7^3/_4$ × $7^3/_8$ in.

Starter motor axis is placed at right angles to the engine axis permitting a low silhouette of approximately $3^1/_2$ in. above the engine shroud.

—KI–25

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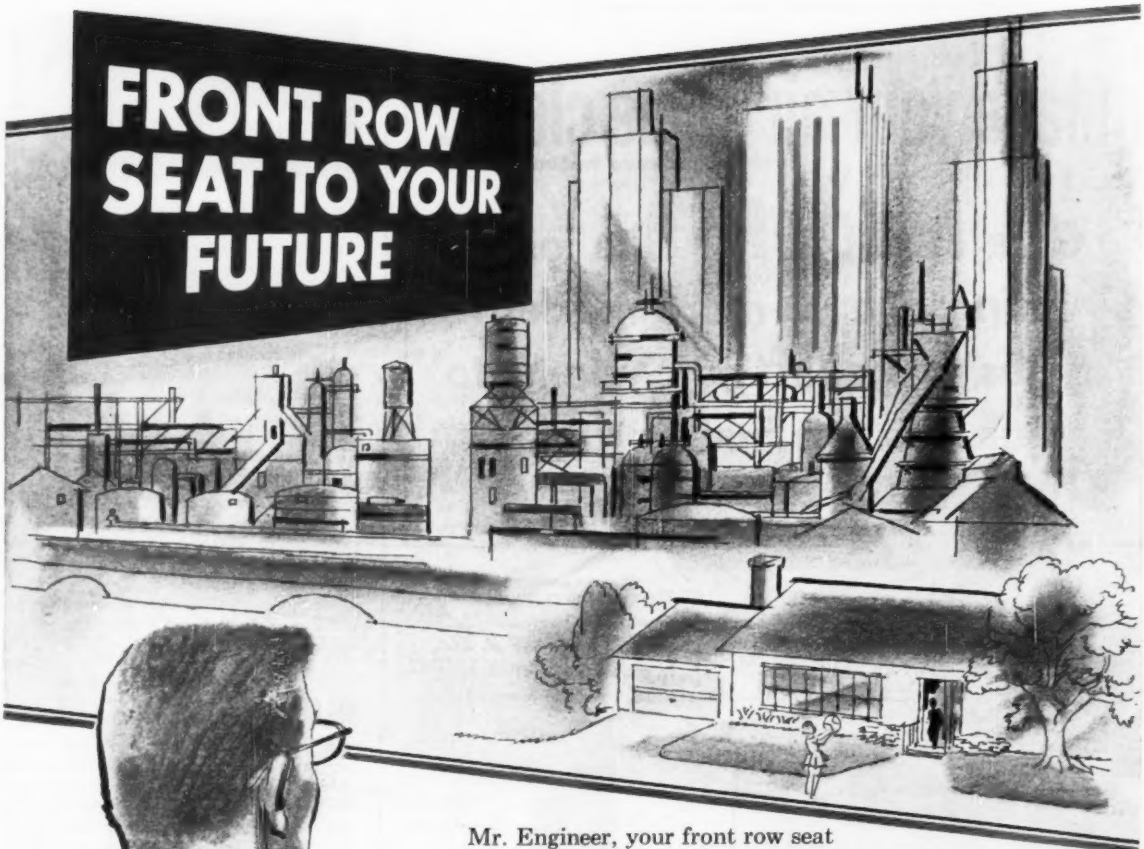

Mr. Engineer, your front row seat
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BUSINESS NOTES · NEW EQUIPMENT · LATEST CATALOGS

Oil-Immersed Solenoids

Oil-immersed solenoids are now optional on 2- and 4-way directional valves from Vickers Inc., Detroit 32, Mich. The company reports the oil-immersed units outlive regular solenoids 20 to 30 times.

The new solenoid operates in an oil-filled, sealed housing which can be plugged into the valve. According to the company, cooler operation and two-direction shock mounting provide the exceptional service life. The oil-immersed solenoid is available in all standard voltages.

The valves are designed for heavy duty, continuous and rapid cycling operation at pressures to 3000 psi. They are available in seven spool types. Mounting position is unrestricted on spring-centered and spring-offset models. All models are available for either gasket or subplate mounting. Conversion kits are available to replace regular solenoids. **—KI-26**

High Frequency Machine

A new 9600 cycle special vertical motor generator combination control and heating station for preheating and diffusing automotive valves during aluminizing operations has been developed by Lindberg Engineering Co., 2444 W. Hubbard St., Chicago 12, Ill.

The unit consists of a motor generator, a control station for regulating and controlling the application of high-frequency power and two heating stations, one above the other, to apply high frequency power to the inductors for preheating and diffusing the valves.

A vertical conveyor system wrapped around the 14-ft high cabinet moves the valves through the various operations and is loaded and unloaded automatically from the shop overhead conveyor. A metallizing gun with separate control panel sprays the valves with molten aluminum which in the subsequent heating operation forms a hard heat resistant iron aluminum alloy to withstand the high temperatures of the new high powered motors.

A supervisory system maintains a constant check on air temperature, water temperature, high voltage interlocks, water flow and other operating conditions of both motor generator and work stations. Signal lights instantly reveal abnormal conditions at any of the many protective devices, the company says.

Spindle type work-holding fixtures rotate the valves at approximately 1000 rpm past the metallizing operation and approximately 100 rpm at the preheat and diffusing stations. Variable ratio transformers reduce the voltage from approximately 800 to 40–80 v at the preheating inductor to 80–160 v at the diffusing inductor where final heat is applied to provide operating temperatures of 500 F and 1500 F respectively. No flux is required and valves can be aluminized at a rate up to 3500 per hour with the automated loading and unloading method. **—KI-27**

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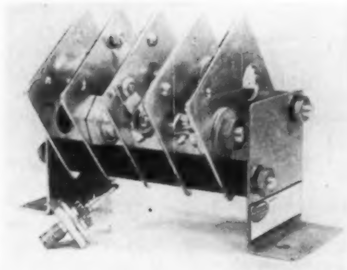

Silicon Rectifier Stacks

Stack assemblies of silicon rectifiers are now available from Automatic Mfg. Div., General Instrument Corp., Newark, N. J.

Pictured above is a single phase full wave bridge assembly, rated at 25 amp average rectified current at an rms input of 245 v with forced air cooling, utilizing 2 × 2 in. fins. The over-all dimensions of this assembly are 5 × 3 × 2 in. The units are designed for high reliability under the most severe environmental conditions of moisture and vibration fatigue, high acceleration vibration, centrifuging, shock and temperature cycling. The firm says they have been successfully operated at ambient temperatures ranging from −50 C to +165 C, and they can be stored at temperatures ranging from −65 C to +180 C. —KI-28

Teflon Adhesives

Three new adhesives for bonding treated Teflon to other materials or to itself have been developed by the Adhesives Dept., Raybestos-Manhattan, Inc.

The adhesives—designated as Ray-BOND R-86004, R-86024, and R-81001—are designed to permit the effective bonding of treated Teflon to wood, steel, glass, aluminum, copper, ceramics, plastics or any other material that will bond with an adhesive, the company reports. As a group, the new adhesives meet the requirements for strength, chemical resistance, flexibility and temperature resistance for practically all Teflon bonding applications, the firm states. —KI-29

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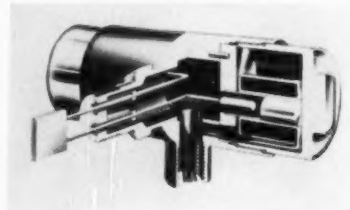

Level Control

Automation Products, Inc., 3030 Max Roy St., Houston 24, Tex., announces its Model CL-10 Dynatrol utilizing new design principle for extremely accurate and versatile high or low point detection or narrow range proportional control of liquid, solid and slurry levels.

This control has a positive acting electrical output control signal that varies with the amount of immersion of the 120 cps vibrating paddle in the medium being detected. The output signal can be used to control the operation of any type of electrical equipment, the firm says.

The design allows sensitive transmission of vibrational energy from the driver end to the sensing paddle and back to the output signal end through a linkage path welded to rigid metal pressure seals at the node points where zero amplitude of vibration occurs. The unit is rated for 3000 psig pressure, explosion proof 115 v-a-c. It is corrosion resistant and any mounting position with $^3/_4$ in. NPT pipe opening can be used. **—KI-30**

Lift Truck Shift

Yale Materials Handling Div., Yale & Towne Mfg. Co., 11,000 Roosevelt Blvd., Philadelphia 15, Pa., has introduced a swing shift, side shift attachment for its new line of gasoline powered industrial lift trucks in capacities of 15,000 to 20,000 lb.

The swing shift, side shift is designed for use in operating large, high capacity lift trucks in outdoor areas where loads of varying length and size are handled.

By allowing the fork carriage to be shifted to either side of center and rotated on an axis in either direction this attachment greatly lessens the amount of maneuvering necessary to get the truck in proper position to pick up or deposit a load, the company says. Both actions are achieved hydraulically.

The new attachment can shift the truck forks and load six inches to either side of center. The swing shift characteristic permits slewing forks and load in a 10 deg arc in either direction away from the normal straightforward position.

Controlled by separate handles, the function of side-shifting and swing-shifting can be accomplished independently or in combination, the firm reports. **—KI-31**

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Vacuum Switch

Development of a vacuum switch that automatically signals inefficient engine operation caused by a reduction of manifold air pressure is announced by Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville, Tenn.

Application of the switch, the company points out, is primarily for gasoline and diesel-powered engine equipment which uses the recently perfected, positive type paper element air cleaner. The switch would be equally suitable for industrial equipment where a signal to indicate a vacuum change is desired, it is reported. **—KI-32**

Variable Drive Control

A new remote electrical control system for its line of infinite range variable speed drives is announced by Graham Transmissions Inc., Menomonee Falls, Wis.

The firm says the new control provides remote setting of speed with high accuracy or adapts the transmissions for use in automatic speed control systems such as tension and velocity control, register control, load control of grinders and pulverizers, blending and proportioning control. Control actuator and indicator are available in standard and explosion proof types. The actuator mounts in place of standard mechanical controls and can be installed on drives already in service, the company states.

The unit includes a precision speed indicating meter calibrated from 0 to 100 with linear readings over the entire range. Readings near 0 are not condensed as was the case with previous controls. A ratio adjusting knob behind the front panel of the indicator may be set to provide linear full scale readings for as little as $^1/_{10}$ the normal speed.**—KI-33**

BUSINESS NOTES

Move New York Offices

Foster Wheeler, New York engineering and construction firm, announced plans to move its New York Offices to the new Tishman Building, 666 Fifth Avenue. The corporation which employs approximately fifteen hundred engineers and related skills is presently located at 165 Broadway with drafting offices at 44 Beaver Street and engineering departments at 117 Liberty Street. Foster Wheeler will occupy 240,000 sq ft of space on five floors of the new building representing approximately 22 per cent of the rentable area of the 38 story skyscraper. The move will be accomplished as soon as the new space is completed.

Expansion Program

Calumet Steel Div., Borg-Warner Corp. has completed plans for a multimillion dollar expansion and improvement program at its facilities in Chicago Heights, Ill.

The program, largest ever undertaken by the division, will be divided into two stages, the first of which will increase capacity by at least 40 per cent, improve product quality, broaden the product line, reduce costs, and make possible 24-hour-a-day operation. This is scheduled to be complete by December 31, 1959.

Second phase of the program, which contemplates the installation of electric furnaces and additional rolling and finishing facilities, is scheduled for completion by mid-1961. Purpose of this part of the undertaking is to broaden the division's market base and add to the line new billet steel products.

Circuit Breaker Plant

Construction of a Westinghouse Electric Corp., multimillion-dollar power circuit breaker plant in Trafford, Pa., will begin in early 1958, the firm announces.

The plant will be a one-story structure with 241,000 sq ft of manufacturing space. The building will be 550 ft long, 420 ft wide and will be comprised of seven bays—one of which will be 60 ft high. The manufacturing aisles will be 60 ft wide.

LATEST CATALOGS

Silent Chain Drives

A comprehensive book on silent chain drives, No. 2425, is available from Link-Belt Co., Chicago 1, Ill. It contains 88 pages of detailed engineering data and illustrations of silent chain in a wide range of applications.

The book contains tables of service factors, ratings, chain length and center distance computations. Pre-engineered stock drives are listed in one 16-page section. A 22-page section outlines the procedure for selection of engineered drives. Another section on drive components lists available chain widths; chain and wheel dimensions; wheel tolerances, materials, and other data. **—KI-34**

Regulator Valve Sizing

Jordan Corp., 6013 Weihe Rd., Cincinnati 13, Ohio, has published a four-page bulletin, J-SC, showing how to size its sliding gate regulator valves.

Technical data applying to all makes of valves tells how to adjust sizing for variations in pressure, temperature, viscosity, specific gravity. Charts cover steam, liquid, and gas services. The company says a cross-reference method of compiling eliminates need to use rulers or slide rules. **—KI-35**

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Electronics Facilities

A 12-page, 40-photograph brochure, providing detailed facts and figures on its electronics engineering and production capabilities, has been published by LearCal Division of Lear, Inc., Dept., 3171 S. Bundy Drive, Santa Monica, Calif. **—KI-36**

Steel Tubing

A general catalog, CS-58, describing seamless and electric-resistance welded steel tubing has been issued by Ohio Seamless Tube Div., Copperweld Steel Co., Shelby, Ohio.

This edition describes carbon and alloy seamless steel tubing in mechanical, aircraft mechanical, airframe quality and pressure grades. Electric-resistance welded steel tubing, carbon steels, is covered in mechanical and pressure grades. Fabricating and forging of steel tubing into special shapes and parts to customer specifications is also described. **—KI-37**

Control Valve

A bulletin issued by A. W. Cash Co., Box 551, Decatur, Ill. contains information, photographs, and engineering drawings on the firm's Cash Standard Type 505 high pressure control valve.

The valve is designed for 10,000 psi service and is said to provide close control in the handling of gases and liquids in high pressure drop, on-off or throttling service, with dead-end shutoff. It is available in either direct or reverse acting models. Information in the bulletin also includes construction details, pressure and temperature ratings and sizing formulas for liquids or gases. **—KI-38**

Four-Slide Machine

Major operating features and specifications for its new Verti-Slide all-purpose vertical four-slide machine are given in an eight-page technical bulletin, V-82, published by Torrington Mfg. Co., Torrington, Conn.

Design details and component functions are given for the feed mechanism, cam and cam shafts, drive system, and presses. Close-up photos illustrate the operation of the slides and slide bases, center former, lubrication system and clutch. **—KI-39**

Centrifugal Fans

A catalog on centrifugal fans is available from Westinghouse Sturtevant Div., Dept. T-406, 200 Readville St., Hyde Park, Boston 36, Mass.

This catalog describes the efficiency and quietness of airfoil blading for all-purpose applications in a complete standard line of centrifugal fans (Series 8000) covering requirements up to 700,000 cfm and up to $16^3/_4$ in. total pressure. Selection charts are included, and block dimensions and fan arrangements are detailed. **—KI-40**

Spot, Press Welders

A six-page bulletin, No. 101, on spot and projection press welders is available from Precision Welder and Flexopress Corp., 3520 Ibsen Ave., Cincinnati 9, Ohio.

Specifications for entire line which includes resistance welders from 30 to 600 kva, 1275 to 18,000 lb electrode forces, 12 to 30 in. throat depth are listed, along with a variety of air cylinder and electrode arrangements. Optional features and major product features are illustrated and described, along with examples of special tooling. **—KI-41**

Air Conditioners

A 16-page illustrated bulletin, No. 8827, describing its line of inductor air conditioners for perimeter air conditioning of multi-storied buildings is available from American Blower Div., American-Standard, Detroit 32, Mich.

The catalog outlines and illustrates the features and characteristics of the inductor units, covering such supplementary information as installation, adjustments and controls. A special section is devoted to inductor unit selection. **—KI-42**

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Miniature Brakes

Warner Electric Brake & Clutch Co., Beloit, Wis., announces Catalog Digest WEB 6292, giving facts on electric brakes, clutches and controls for miniature mechanisms or high torque machine drives. **—KI–43**

Conveying Systems

A four-page bulletin on developments in automatic interfloor conveying systems for unitized loads is being offered by Gifford-Wood Co., Hudson, N.Y.

Covering pallets, tote bins, bales, drums, paper rolls, textile beams, cartons and other packaged units, the bulletin describes the versatility, speed, safety and smooth transfer features of modern automatic conveying systems. Nine photographs show equipment in operation in industrial plants, and four schematic drawings indicate the way various elements can be combined into a single system to solve special problems. **—KI–44**

Processing Service

The firm's 1958 general catalog is available from Goslin-Birmingham Mfg. Co., 2004 Eighth Ave. S., Birmingham, Ala.

The new catalog outlines the company's facilities and services including service to processors all over the world with evaporators, vacuum pans, vacuum crystallizers, dryers, drum filters, leaf filters and flakers. The catalog also covers the contract manufacturing division of the company with service for the repair and rebuilding of heavy process equipment, the manufacture of custom equipment and foundry service for heavy castings. **—KI–45**

Electric Drills

A four-page folder, JE-2263 featuring the new series of reversible heavy-duty electric drills recently introduced by Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill. now is available.

The folder details the additional power, design developments, and complete specifications of the new EN series of $^5/_8$, $^3/_4$, $^7/_8$, and 1-in. reversible portable electric drills. Also included are specifications of EL and EJ electric drill series, screwdriver-nutsetters, and impact wrenches. **—KI–46**

Quick Release Valves

Bulletin ML-177, a six-page folder describing functions and applications of Rotorseals and quick release valves, has been published by Fawick Airflex Div., Fawick Corp., 9919 Clinton Rd., Cleveland 11, Ohio.

Rotorseals are described as a means of transmitting air, liquid or gases under pressure or vacuum from a stationary source into a rotating shaft. The bulletin includes full technical data and dimensional data in table form. **—KI–47**

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Investment Castings

A two-color brochure on investment castings has been issued by Hitchiner Mfg. Co., Milford, N. H.

The brochure contains information on cutting costs or improving performance by replacing machined or assembled parts with investment castings. Outlined are the care and precision demanded in the manufacture of investment castings. The advantages of the process are detailed, the various steps in the casting manufacture are explained and illustrated. **—KI-48**

Distributing Coils

An eight-page catalog, Bulletin B-1418, describing its new D-1 double-tube steam distributing coils is available from American Blower Div., American-Standard, Detroit 32, Mich.

The catalog describes the features of the new units and gives physical data illustrated with an installation drawing. A two-page section on selection data includes tables on final air temperature and temperature rise correction factors. Air friction tables and piping instructions, complete with typical piping diagrams, are listed. **—KI-49**

Commercial Fasteners

A 12-page catalog, Form 8-414, describing CL commercial Huckbolt fasteners and their application is available from Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Mich.

Included in the catalog is such data as fastener nomenclature, shear and tension values, hole size recommendations and a sequence drawing illustrating the driving cycle of the fastener. Dimensional information for the firm's line of fasteners is tabulated covering both metal-to-metal and wood-to-metal applications. **—KI-50**

Steel Gate Valves

A four-page illustrated bulletin describing its 150-lb and 300-lb cast steel gate valves is announced by the Walworth Co., 60 E. 42nd St., New York.

The bulletin lists ten features of the valves, stressing their durability, easy maintenance and erosion-resistant properties. It also provides dimension and weight charts and line drawings for each type. **—KI-51**

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Exhausters, Compressors

Bulleting 4E, published by Schutte and Koerting Co., Dept. JA-2, Cornwells Heights, Pa., describes the company's line of exhausters—air and gas pumps which operate on the jet principle, at moderately high vacuum, using live steam or air as the motive force.

The standard, stock units are used for such services as pump priming, exhausting, evacuating, cleaning, transporting, compressing, agitating, and general vacuum service. The bulletin includes application, construction, and operation information on the various types and sizes manufactured including those for laboratory applications and types for use in chemical service.—**KI-52**

Hot Pipe Insulation

Underground hot pipe insulation is described in a 12-page folder available from Z-Crete Div., Zonolite Co., 135 S. LaSalle St., Chicago 3, Ill. The brochure contains sequence photographs and diagrammatic drawings of this cast-in-place monolithic conduit system. Features cited are efficient insulation, substantial structural pipe support, high mechanical and load bearing capabilities and extreme resistance to water penetration.

—**KI-53**

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Seamless Pipe, Tubing

Technical Data Card 188, released by Tubular Products Div., Babcock & Wilcox Co., Beaver Falls, Pa., supplies analysis details and comparative price ratios of 33 seamless stainless grades of pipe and tubing using Type 304 (18-8) as a base. **—KI-54**

Car Shaker

Features of a car shaker said to be responsible for increases of up to 750 per cent in unloading volume are described in a bulletin, No. 07B7221B, released by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Designed for unloading of granular material from open, hopper-bottom gondola cars, the car shaker has lift bars with spaced holes to facilitate centering on car eaves and make easy the attaching of hooks or shackles of any hoist. **—KI-55**

Special Steels

Special process equipment and facilities for the production of drawn steel shapes are described in an eight-page brochure published by Reliance Div., Eaton Mfg. Co., Massillon, Ohio.

The facilities handle cold drawn, cold rolled and centerless ground carbon, alloy and stainless steels, and other non-ferrous metals for use by the metal fabricating industries. **—KI-56**

Steam Turbine-Generators

Design and application of medium capacity steam turbine-generator units is described in a bulletin, GEA-3277D, available from General Electric Co., Schenectady 5, N. Y.

The bulletin contains information and data on condensing turbines utilizing either nonreheat or reheat; noncondensing turbines; single, double and triple automatic extraction turbines; admission units; and admission-extraction steam turbines. A special seven-page section relates to the intricate governing system employed on the turbines. **—KI-57**

Complete SPS Fastener Line

Precision industrial fasteners for a variety of production assembly and maintenance applications are reviewed in a revised bulletin published by Standard Pressed Steel Co., Jenkintown, Pa.

The four-page bulletin covers the firm's line of standard industrial fasteners including Unbrako socket screw products, Flexloc self-locking nuts, Sel-Lok spring pins and Hallowell steel collars. The illustrated literature gives range of sizes, materials finish and other specifications for socket head cap and set screws, shoulder screws, both regular-height and thin self-locking nuts, clinch nuts, dowel pins, spring pins and collars. **—KI-58**

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Nozzle Manufacture

The story behind the manufacture of Oxweld flame-cutting nozzles is told in a 12-page folder prepared by Linde Co., Div. of Union Carbide Corp., 30 E. 42nd St., New York 17. N. Y.

The folder describes and illustrates some of the production steps that go into the manufacture of cutting nozzles. **—KI-59**

Worm Gear Drives

Technical information on the design and application of double-enveloping worm gearing is presented in Bulletin CD-200 available from Cone-Drive Gears, Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

The 24-page brochure contains detailed engineering formulas and step-by-step instructions for using them in designing and applying gearing to drives of all types. Service factors and lubrication information also are included. **—KI-60**

Organic Chemicals

A 1958 "Physical Properties" booklet has been issued by Union Carbide Chemicals Co., Div. of Union Carbide Corp., 30 E. 42nd St., New York 17, N.Y.

The 28-page booklet is a guide to the firm's products and services. The latest physical property data is presented on more than 350 organic chemicals. An alphabetical index is included for the convenience of the user. Fifty new chemicals introduced by the company since the previous edition are featured. **—KI-61**

Mechanical Shaft Seals

Rotary Seal Div., Muskegon Piston Ring Co., Sparta, Mich., has issued a 12-page brochure, explaining the principles of mechanical shift sealing.

It describes and illustrates the basic component parts of the seals, and comments on variations possible for solving different sealing problems with greatest efficieny. Prints of important basic types of applications are shown, with an acetate overlay detailing seal construction and positioning for each. **—KI-62**

Electronic Instruments

A short form catalog on electronic instruments has been released by Eldorado Electronics Co., 2821 Tenth St., Berkeley, Calif.

Instruments included are Model CL 100 accelerator current integrator, Model PH-200 universal photomultiplier photometer, Model TH - 300 milli - microsecond time - to-pulse height converter, and Model PA-400 multi-channel pulse-height analyzer. **—KI-63**

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Pipeline Dredges

Increasing versatility of low-cost portable hydraulic pipe line dredges is discussed in a 12-page, two-color bulletin now available from the Ellicott Machine Corp., Baltimore, Md.

Thirty-eight photographs show the firm's Dragon model dredges in operation on a variety of projects throughout the world. Portability, size, and factors in the engineering and design of the dredges that have increased the scope of hydraulic dredging are explained. The photographs illustrate 15 different applications. **—KI-64**

Hydraulic Pumps

Bulletin A-5206-B, published by Vickers Inc., Detroit, Mich., covers recent developments in its line of airborne constant displacement piston type hydraulic pumps. It replaces Bulletin A-5206-A.

The new bulletin lists 36 sizes instead of 32 as formerly. Theoretical flow capacities now range from 0.318 gpm to 38.116 gpm at 1500 rpm. Units are lighter in weight and the recommended maximum continuous and intermittent speeds at 3000 psi have been increased in most sizes. Upper limit of ambient temperature has been raised from 160 to 275 F. **—KI-65**

Dual Output Lubricator

Description, operation, and applications of a dual output lubricator are included in a two-page, illustrated technical reference offered by Bijur Lubricating Corp., Rochelle Park, N. J.

The reference sheet describes type AP-lubricator, which provides for two independent lubricating systems on a single machine—one system providing continuous flow, constant pressure lubrication to certain bearings—the other system providing cyclic or periodical lubrication to other bearings. This dual output design makes the unit suitable for automatic screw machines, chucking machines and packaging machinery where various bearings require different lubrication cycles, the company states. **—KI-66**

Motor Control

The latest design features in Allis-Chalmers front access, high voltage starters, Type H, for 2300 to 5000-v motors are given in a new bulletin released by the company.

The bulletin, No. 14B8507, points out how the starter's roll-out type air-break contractor, Type 256A, makes inspection and routine maintenance of the unit easy. The starter is available with oil-immersed contactor where dust, dirt, moisture, and corrosion are problems. It fits in the same space as the air-break contactor. **—KI-67**

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Flue Gas Analysis

A four-page publication, Application Data Sheet 463-60, describing its new magnetic O_2 system for flue gas analysis is available from Leeds & Northrup Co., Philadelphia 44, Pa.

A full-page display of a recently installed O_2 system shows the functional relationship of the reverse jet probe and steam sampler units, regular and auxiliary sample averaging units, magnetic O_2 analyzers and speedomax recorders, and a test O_2 assembly as used in a new 220,000-kw twin-furnace boiler. **—KI–68**

Filter-Separator Unit

A new file of data on its 15-gpm filter, separator is available through Richmond Engineering Co., 7th and Hospital St., Richmond, Va.

The bulletin includes a check list of 49 industrial and commercial liquids which can be continuously cleaned by the unit—notably diesel fuels, solvents, refinery control stocks, gasolines, lube oils, boiler feedwater, process intermediates, industrial waters, and marine and aircraft fuels. Of the list, 35 call for the use of the water-separator shroud, Model SV-11A, while 14 call for the filter cartridge for retaining solids Model SV-11). **—KI–69**

Web Conditioner

J. O. Ross Engineering Corp. 444 Madison Ave., New York, offers an eight-page, two-color bulletin covering its new web conditioner for controlling the addition of moisture to paper, paper board, textiles, leather, plastics, tobacco.

As explained and illustrated in the bulletin, material travels continuously through the conditioner between opposing banks of steam nozzles. Steam pressure is regulated to control the addition of moisture as desired. A steam zone at the entrance of the unit preconditions the web before reaching the nozzles and an exhaust system discharges spent steam to the atmosphere. The bulletin also illustrates and describes typical conditioner applications and lists 14 conditioner advantages, nine examples of moisture gains by different web materials, and 28 users of the new unit. **—KI–70**

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Precision Gears

Grant Gear Works, Inc., 154 W. 2nd St., Boston 27, Mass. has released a six-page brochure, PG-100 on precision gears, commercial gears, speed reducers and motorized reducers.

The major portion of the brochure is devoted to precision gears and outlines many of the ranges, sizes and types available. It illustrates production steps used in the manufacturing process. **—KI-71**

Heat Exchanger Costs

Wolverine Tube Div., Calumet & Hecla, Inc., Detroit 26, Mich., has announced a booklet on design and cost comparison of heat exchangers.

The booklet gives a rapid analysis of the comparable costs between a plain condenser tube and the firm's Trufin Type S/T shell and tube exchanger over the range of the more common applications. **—KI-72**

Ultra-Strength Steels

Ultra-strength structural steels with yield strengths over 200,000 psi are described in a 16-page booklet published by Climax Molybdenum Co., with the assistance of the American Iron and Steel Institute, the U. S. firms producing these steels, and several welding companies.

The new booklet describes in detail all of the grades of ultra-strength steel available in the United States today. Containing technical data and a number of tables concerning the composition and properties of these materials, it also outlines their various end uses. From Climax Molybdenum Co., 500 Fifth Ave., New York 36. **—KI-73**

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Electronic Weighing

Streeter-Amet Co., Grayslake, Ill., has issued a bulletin describing electronic weighing by the firm's electronic crane scale.

According to the bulletin, savings in time, space, and manpower is effected because weighing and transportation are done at the same time. The exact weight of heavy loads may be recorded on tape, ticket or cards in a cab located away from the weighing area. **—KI-74**

Roller Bearings, Bushings

Roller Bearing Co. of America, Sullivan Way, West Trenton, N. J. announces three bulletins on bearings and bushing assemblies.

Form No. SF-86 illustrates and describes heavy duty self-aligning bushing assemblies for industrial and aircraft applications. Form No. SF-88 covers specifications and dimensions of bearings and assemblies. An interchangeability list of data on bearing maintenance is included in this general catalog. Form No. SF-85 shows design features of the company's Pitchlign bearings. **—KI-75**

Metal Protection

"Kenplate Tungsten Carbide Surfacing" is the title of a new bulletin issued by Kennametal Inc., Latrobe, Pa.

The four-page bulletin describes the new product's uses in protecting metal parts against abrasion and wear, and application methods. Kenplate consists of small hexogonal carbide buttons assembled on a flexible backing material for bonding on metal surfaces, the bulletin explains. **—KI-76**

Speed Reducers

Some 164 standard styles and sizes of double-reduction speed reducers in ratios ranging from 75:1 to 4900:1 are covered in a 20-page catalog, CD-230, released by Cone-Drive Gears, Div. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

The reducers are available in worm over, worm under or gear shaft vertical models. Output torque ratings range up to 618,000 in.-lb. The firm says an ingenious specifications arrangement makes it easy to select a reducer of the exact capacity, type and ratio desired to fit almost any given job. **—KI-77**

Teflon Hose Assembly

A four-page, illustrated aircraft catalog supplement describing the new Springfield 110 Teflon hose asembly has been issued by Titeflex, Inc., Springfield, Mass.

Design specifications, fitting assembly data, hose data and detailed cross-section drawings of the assembly are included in the folder, which also gives information for ordering various types of assembly. **—KI-78**

Non-Clog Sump Pumps

A four-page catalog describing the firm's 3- and 4-in. nonclog sump pumps is available from Economy Pump Div., C. H. Wheeler Mfg. Co., 19th and Lehigh Ave., Philadelphia 32, Pa.

Design and construction details and accessory photographs and descriptions of the heavy-duty pumps, designed for drainage, underpass service, sewage disposal and applications in reduction plants, are provided in the bulletin. Capacities range from 20 to 1100 gpm, and heads to 160 ft. **—KI-79**

GET THE BEST SOLUTION TO EVERY FLOW

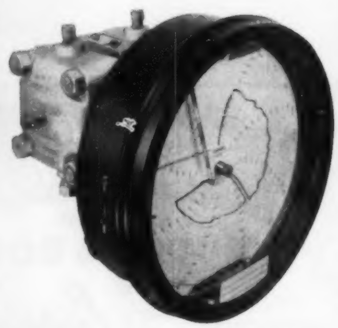
... with Foxboro Instrumentation

Differential Pressure Cell Transmitters

Complete line includes air-operated and electric-operated d/p Cell Transmitters covering ranges from 0-20" to 0-850" of water; working pressures up to 4000 psi.

Type 13A d/p Cell Transmitter

- Positive Overrange Protection—up to full 1500 lbs. rating
- Fully Adjustable Ranges—0-20" to 0-850" water
- Automatic Internal Damping — fast, stable measurement
- Simplicity—easiest, lowest-cost installation, lowest maintenance



Type 37 Diaphragm Meter

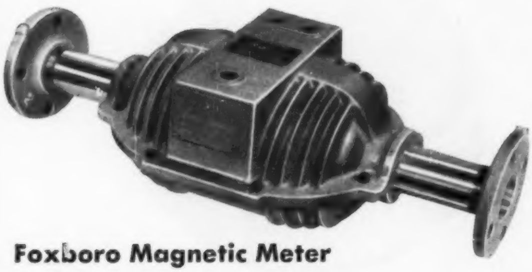
- Uses no mercury
- Positive overrange protection at static pressures up to 2000 psi
- Exclusive Features — Built-in temperature compensation never needs change or adjustment; twin-spiral range springs readily accessible for easy range changing
- Unique packless drive bar transmits linear motion to pen arm
- Ranges of 20", 50", 100", 200"; available in round or rectangular cases; 316 stainless or carbon steel body

PROBLEM

THERE ARE two logical reasons why Foxboro Instrumentation assures you optimum results in measurement or control of process fluid streams. First: Foxboro offers the widest variety of measuring and controlling devices . . . the right equipment for every application. For example, only Foxboro offers all these basic meter types: differential pressure cell flow transmitters, magnetic meters, mercury meters, and weir meters. Second: Foxboro provides 45 years of engineering experience in every phase of fluid mechanics.

From the simplest general utility-type instrument to complex automatic ratio control systems, you get highest accuracy, efficiency, and economy. Whenever you have a flow problem involving liquids, vapors, gases or slurries — in pipes, ducts, or channels, you can solve it best by specifying Foxboro.

Only a few instruments are described on these pages. For full details: or for specific information on your problem, contact your nearby Foxboro Field Engineer, or write **The Foxboro Company, 961 Neponset Ave., Foxboro, Mass.**



Foxboro Magnetic Meter

- Measures Fluid Velocity Directly
- Adds No Pressure Drop
- Uniform Flow Scale
- Overall Accuracy Better than 1% of Range Over Entire Scale
- Full Accuracy Sustained Even on Liquids Other Meters Can't Handle — even sand and water slurries

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FIRST IN FLOW

Mercury Type Meters

- Permanent Full-Scale Meter Accuracy — exclusive segmental lever design provides linear transmission from float to pen
- High-Powered Pen Drive—large float with long travel
- Minimum Ambient Temperature Effects — float located in high pressure chamber
- Ranges from 2" to 400" of water; working pressures up to 5000 psi

Other Foxboro Flow Instrumentation

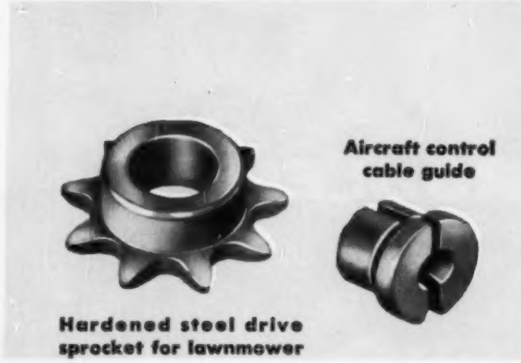
Electric or Pneumatic Type Rotameters

Electric, Pneumatic, and Mechanical Integrators

Planimeters

All Primary Elements, Valves, and Accessories required for complete flow measurement and control systems

WHATEVER THE APPLICATION...



Aircraft control cable guide

Hardened steel drive sprocket for lawnmower

you can improve your product with

GRAMIX®

(PRODUCT OF POWDER METALLURGY)

Self-aligning guide bearing for industrial blower shaft

PRECISION FINISHED PARTS

GRAMIX precision finished parts are improving products in virtually every branch of industry. A pump manufacturer, for instance, may specify a gasoline pump rotor made of GRAMIX and gain a number of advantages.

To begin with, the alloys are carefully blended to meet his individual requirements. The GRAMIX parts are then die-pressed to exact shape, sintered under rigid control and finished to tolerances as close as .0005". (This process, of course, costs far less than machining, forging or casting.) The manufacturer can expect the GRAMIX gasoline pump rotor to do a better job because *all* GRAMIX parts are precision engineered and precision controlled from alloying to finishing.

No matter what the application may be, GRAMIX parts fit specifications exactly. Parts may be impregnated with oil . . . to insure a longer life and a quieter operation: if specified, the GRAMIX parts may be coined and work hardened, even prepared for plating.

The rotor is only one of thousands of applications in which GRAMIX precision finished parts have proved to be ideal. Just a few of them are shown here, so consider the components of your products . . . there may be several that could be improved . . . with GRAMIX! Products of powder metallurgy you can rely on.

PM PM MEMBER

THE UNITED STATES

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDERED METAL PARTS • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

that has to take it on the chin...

USS TRI-TEN High Strength Steel

THE PUNISHING ABUSE that today's heavy-duty earth moving and mining equipment has to withstand puts a high premium on durability.

Unless power shovels, draglines, trucks, bulldozers, scrapers and mechanized mining units have the rugged stamina to stay on the job under all conditions, day after day, the many thousands of dollars invested in them can easily become a losing proposition. Breakdowns, repairs and maintenance must be kept to a minimum. That's why USS TRI-TEN High-Strength Low-Alloy Steel is being increasingly used in the vital parts of such equipment.

USS TRI-TEN Steel has special properties that recommend it for applications where maximum ruggedness, toughness, strength and endurance—*combined with minimum weight*—are of prime importance.

An outstanding advantage of this steel, and one that will be appreciated by every equipment user who has been plagued by part breakage during severe cold spells, is USS TRI-TEN Steel's ability to withstand impact shock at sub-zero temperatures.

Not only is USS TRI-TEN Steel very tough but it is very strong as well. Its yield point of 50,000 psi min.* is $1\frac{1}{2}$ times that of structural carbon steel and is combined with a tensile strength of 70,000 psi min. in thicknesses of $\frac{3}{4}$" and under, with moderately lower values as thicknesses increase up to 4". TRI-TEN Steel, too, has greater resistance to abrasion than structural carbon steel. It has twice the resistance to atmospheric corrosion. Its fatigue resistance is 50% higher. And its cost is low.

In addition, USS TRI-TEN Steel has good weldability and excellent workability, important factors that help to cut costs in fabrication and repair work. Our 174-page "Design Manual for High Strength Steels" will guide you in applying USS TRI-TEN Steel most efficiently and economically. Write for your free copy—on your company letterhead, giving your title or department—to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

**Still higher strength can be obtained with USS "T-1" Steel—a constructional alloy steel that offers a yield strength of 90,000 psi min. and tensile strength of 105,000 psi min. combined with weldability and tremendous toughness.*

To absorb the grief of heavy duty

Used in the Minnesota iron ore mines, the entire interior surface of this 24-cu.-yd. Heil dump truck body is of USS TRI-TEN Steel. The floor is 1"-thick plate, sides and front are $\frac{3}{8}$" plate. Experience on the Iron Range has proved that TRI-TEN Steel provides the strength and toughness necessary to withstand severe impact and loading shocks even in the coldest weather. And it does this better and more economically than many more expensive grades.

United States Steel Corporation, Pittsburgh · American Steel & Wire Division, Cleveland · Columbia-Geneva Steel Division, San Francisco
National Tube Division, Pittsburgh · Tennessee Coal & Iron Division, Fairfield, Ala. · United States Steel Supply Division, Warehouse Distributors
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USS HIGH STRENGTH STEELS

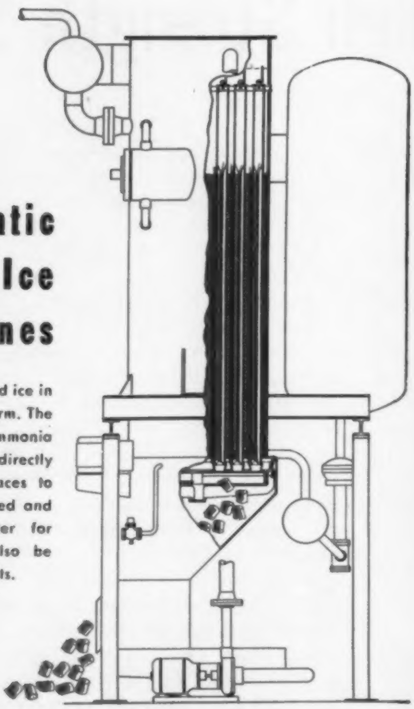
USS MAN-TEN • USS COR-TEN • USS TRI-TEN

UNITED STATES STEEL

GET AHEAD with . . . "YEARS-AHEAD" . . . Vogt

ICE MAKING and REFRIGERATING EQUIPMENT

. . . for the preservation of foods and beverages during process and in storage. Petroleum refineries, chemical plants, and related industries also employ this equipment in various processes. In addition to equipment shown here, we manufacture liquid receivers, pipe coils, and valves, fittings, and flanges for refrigeration as well as for high-pressures and temperatures. Bulletins on request. Address Dept. 24A-R1M.

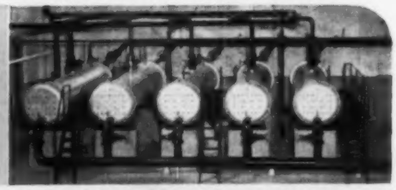


Automatic Tube-Ice Machines

Make clear, hard, sized ice in cylinder or crushed form. The refrigerant, either Ammonia or Freon, is applied directly to the freezing surfaces to produce ice with speed and economy. Cold water for process work can also be supplied by these units.

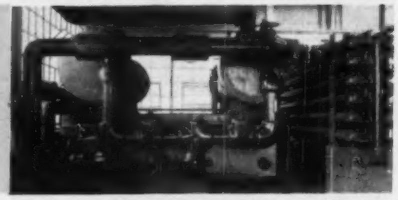
Refrigeration Condensers

Available in horizontal multipass shell and tube types and vertical single pass types for Ammonia or Freon refrigerants. Special metals, lined tubes, etc. can be furnished for unusual operating conditions.



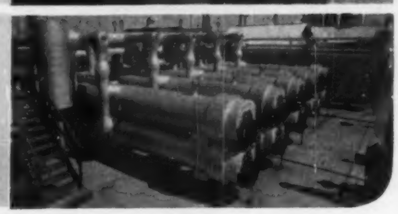
Brine Coolers

Multipass type brine coolers are ideal for closed brine systems in cold storage plants, dairies, packing plants, petroleum refineries, etc. requiring units of large capacity. Also suitable for cooling non-corrosive liquids in general.



Scraped Surface Exchangers

Continuously revolving scrapers sweep heat transfer surfaces clean and keep solids in suspension. Useful in problems of heat transfer with crystallization with high viscosity, or with solvent extraction. Available in double pipe and shell and pipe construction.



HENRY VOGT MACHINE CO., Louisville, Ky.

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Cincinnati

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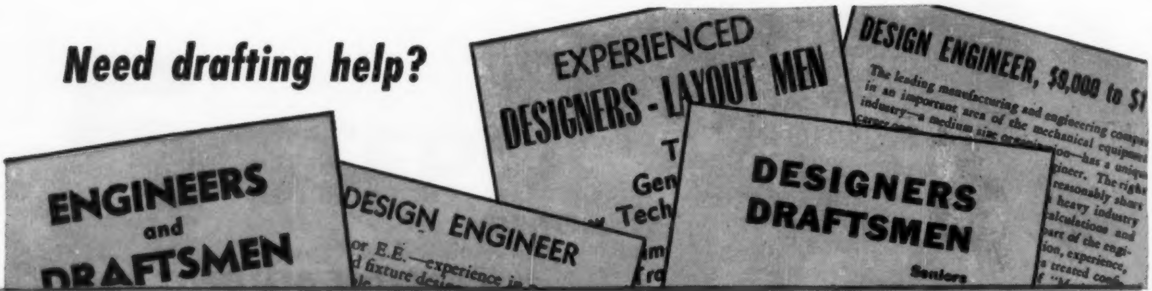

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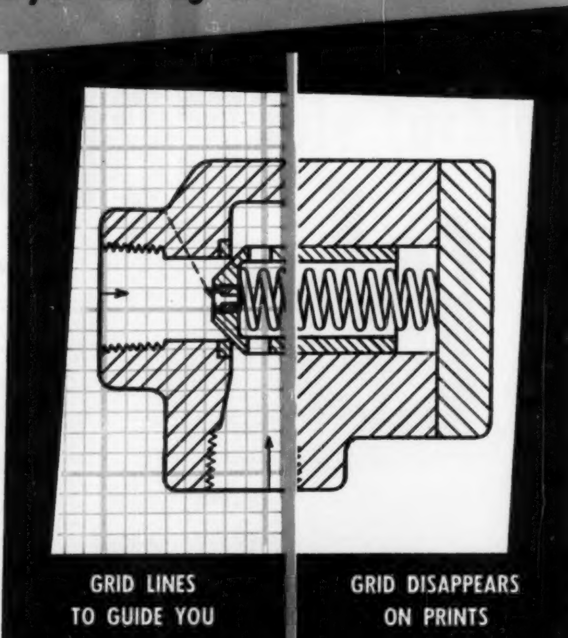

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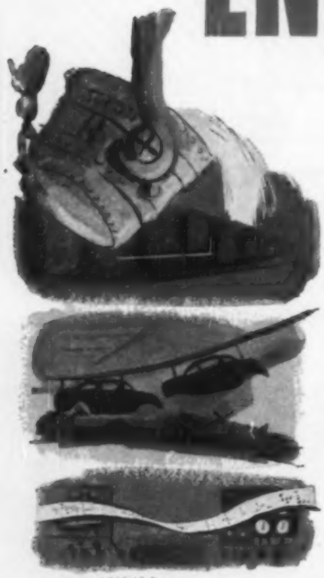
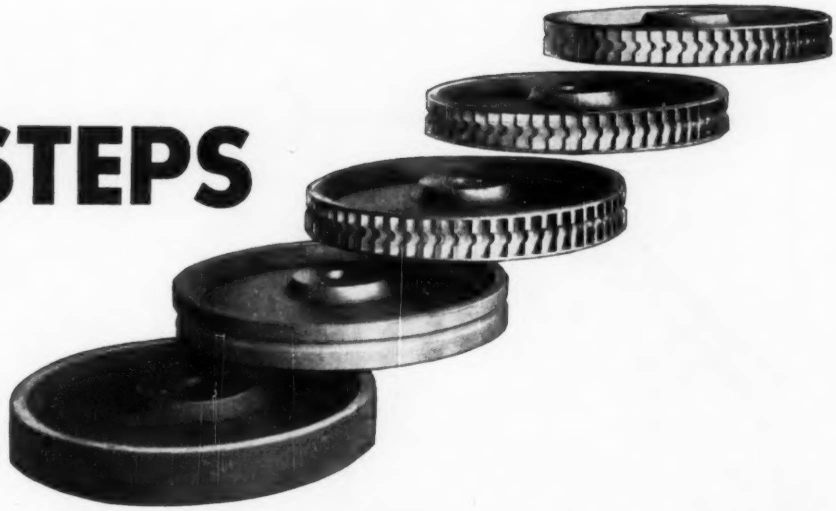
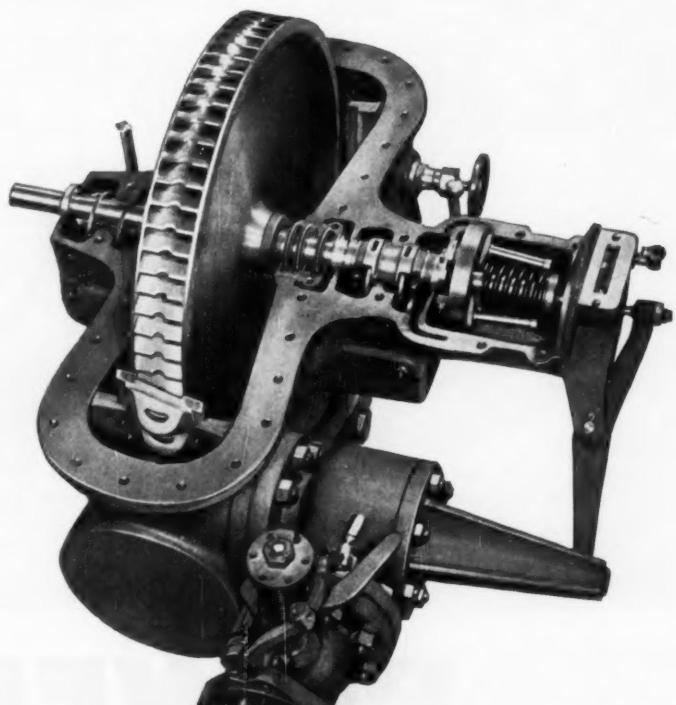


5 STEPS



in making an almost indestructible turbine



The rotor of a Terry solid-wheel turbine is a single forging of special composition steel. It is first rough turned in two operations, as shown, and then two cuts are taken to mill the semi-circular buckets from the solid metal. The wheel at the top has been finished, ready for mounting on the shaft. *The result is a single-piece wheel with no parts to loosen or wear out.*

Blade wear, which might occur after many years of usage, is not important, because the power-producing action of the steam takes place on the curved surfaces at the backs of the buckets. Thus wear does not materially affect horsepower or efficiency.

The blades can't foul. They have a one-inch clearance, and are further protected by the projecting rims at the sides of the wheel.

The Terry solid-wheel turbine is an extremely reliable piece of equipment. Write for details—today. Ask for a copy of bulletin S-116.

THE
TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.

TERRY

TT-1204

Fig. 1314 A—1500-Pound Integral bonnet steel "Y" Valve.

Fig. 19003—Powell Steel Pressure Seal Gate Valve for 900 pounds W.S.P.

Fig. 375—Bronze Gate Valve for 200 pounds W.S.P. Union bonnet, inside screw rising stem.

Fig. 3003 WE—Steel Gate Valve for 300 pounds. Outside screw rising stem and yoke.

Fig. 11365—Steel Pressure Seal Horizontal Lift Check Valve for 1500 pounds.

Fig. 6031 WE—600-Pound Steel Globe Valve for steam service. Outside screw stem and yoke.

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world's largest family of valves

FOR EVERY FLOW CONTROL PROBLEM Powell offers more kinds or types of valves, available in the largest variety of metals and alloys, to handle every flow control requirement. Your local valve distributor will be glad to tell you all about them. Or write to us for the full facts.

THE WM. POWELL COMPANY • *Dependable Valves Since 1846* • **Cincinnati 22, Ohio**

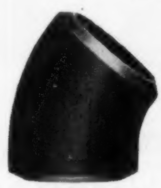
World's First Nuclear-Powered Surface Ship will have MIDWEST Welding Elbows

U. S. Navy's guided missile, nuclear-powered cruiser "Long Beach"

OFFICIAL U. S. NAVY PHOTOGRAPH

Special Fittings are "ROUTINE" for Midwest

Stainless Steel
S.R. 102° Elbow
with tangent on one end.



Stainless Clad
S.R. 39° Elbow
with tangent on one end.

Stainless Steel
S.R. 90° Elbow
with tangent on both ends.

Special Elbows (dimensions, tangents, wall thicknesses and materials) are easily provided by the exclusive and flexible Midwest method. Elbows are available in any material that can be secured as plate, which also means better delivery. Closer tolerances are inherent in the Midwest process. Quality control always exceeds Code requirements.

Shown here are three of the special stainless steel and stainless-clad elbows made by Midwest for the "U.S.S. Long Beach". All reactor coolant piping must meet extremely rigid specifications because of the difficult service. Special quality controls, such as ultrasonic testing, intergranular corrosion tests, dye checking, radiography, and ring flattening tests were used one or more times at various stages of manufacture from the raw material to the finished fittings. Special quality standards for soundness of metal, "water clear" welds, dimensional accuracy, and surface finish were satisfied.

The U. S. Navy's first nuclear-powered surface ship, the "Long Beach", will introduce a radically new concept in defense capabilities. She will operate offensively and independently of other forces under conditions of both nuclear and non-nuclear warfare against airborne, surface or under-sea opposition. In addition to equipment and weapons for detecting and destroying enemy submarines, she will carry the Navy's modern guided missiles.

The piping for the atomic reactors being designed and developed by the Westinghouse Electric Corporation will use a large number of special heavy wall stainless steel Midwest Welding Elbows. This is not the first atomic project for which Midwest Welding Fittings have been used. In fact, when the nuclear propulsion program first began, Midwest furnished special welding fittings for the "Nautilus" prototype installation at Arco, Idaho.

Whether or not you are concerned with nuclear power, Midwest Welding Fittings (both stock and specials) will do a better job for you. Ask your Midwest distributor or write us for Catalog 54, which tells you why.

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Main Office: St. Louis 3, Missouri (P.O. Box 433)

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MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS

You get these extra values at no extra cost with

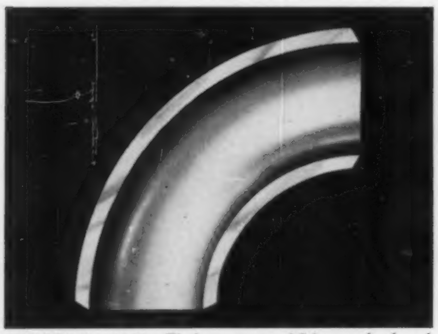
TUBE-TURN

Stainless Steel Fittings

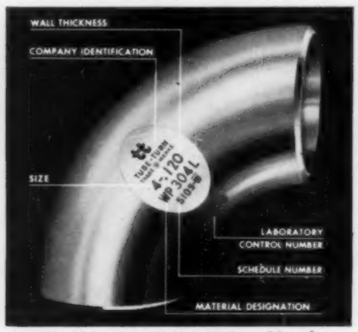
- Fittings meet *all* standard chemistry specifications
- Minimum wall thickness of elbows are at least 87½% of nominal
- All fittings meet calculated bursting pressure of matching pipe
- Qualified welders and procedures used where welding is required
- Each fitting properly solution heat-treated
- Each fitting passivated
- Special grades of stainless steel, and all other alloys available

Meet all codes: ASTM A403 (for material and manufacturing procedure); MSS SP43 and ASA B16.9 (for dimensions); and MSS SP25 (marking procedure).

TUBE-TURN Stainless Steel Elbows and Tee in a petrochemical plant.



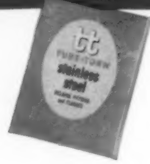
UNIFORM WALL. Fittings meet ASA standards of 87½% of nominal thickness . . . particularly important for light wall elbows. Many conventional stainless steel elbows are as much as 30% to 40% below nominal at this point of greatest wear. All TUBE-TURN* Stainless Steel Fittings, including tees, match calculated bursting strength of the pipe.



COMPLETE IDENTIFICATION. You *know* this fitting conforms to specified quality because the material type and quality control are fully identified. Manufacturer, size, wall thickness and schedule are also marked as shown on the fitting.

CUTS PURCHASING COSTS. You can order TUBE-TURN Stainless Steel Fittings from your nearby Tube Turns' Distributor . . . on the same order as other types of welding fittings in Tube Turns' line of 12,000 products. Cuts red tape. Saves time. Photo courtesy McJunkin Corporation, Charleston, W. Va.

STAINLESS STEEL CATALOG—Complete information on properties, application, standards, welding procedure and all types of TUBE-TURN Stainless Steel Fittings and Flanges. Mail coupon for your free copy.



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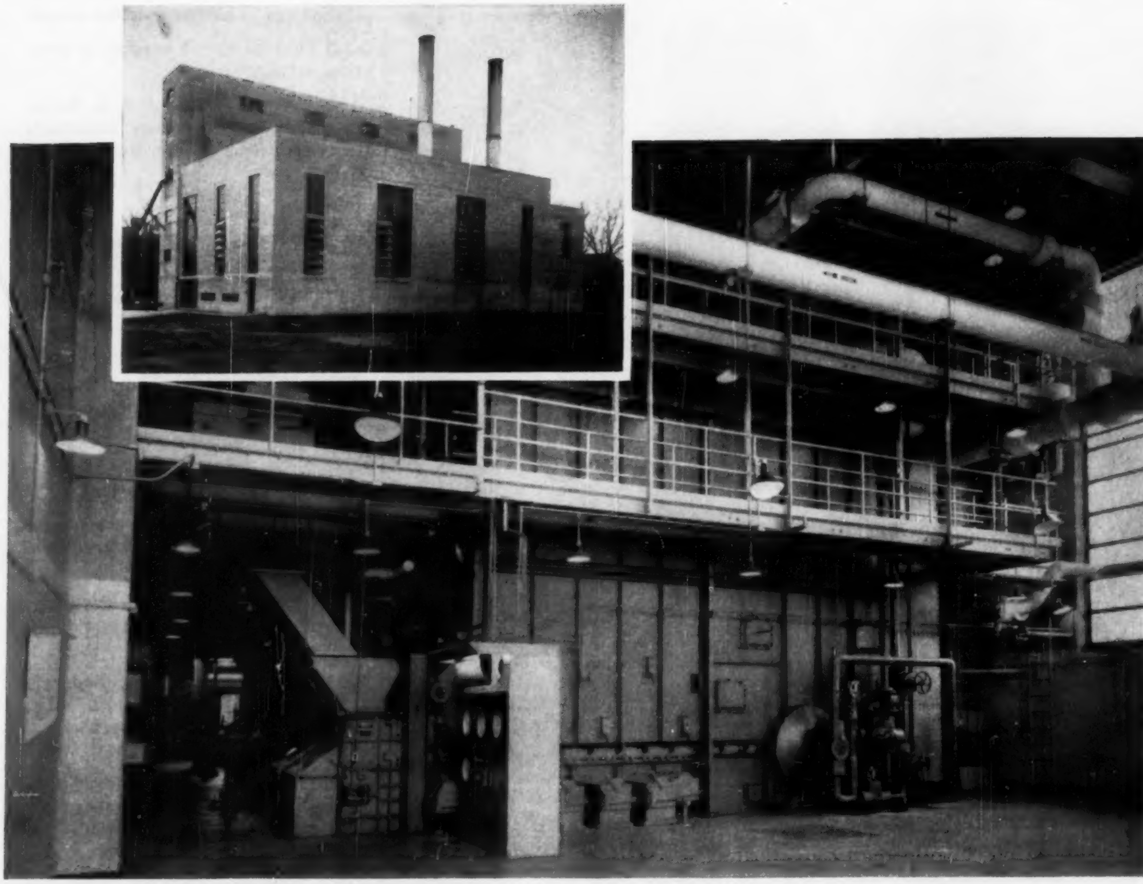


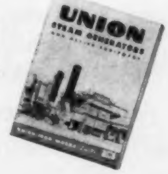
Union Boilers stretch fuel dollars at Mendota State Hospital

A dependable steam supply with low steam generating costs plays a key role in the efficient operation of the Mendota State Hospital. Occupying 384 acres near Madison, Wisconsin, it houses 900 patients and 491 employees in 40 buildings. To reach the furthest point of service, steam travels over half a mile from the power plant.

Carrying the load is a pair of Union 2-drum VO Type Steam Generators. Individually rated at 50,000 lbs./hr. at 165 psi, both units are fired with traveling grate stokers, and together, burn 12,000 tons of coal annually. Since the day this Union Boiler duo was installed, the hospital has enjoyed uninterrupted steam service.

At many institutions as well as industrial and public power plants, careful consideration of long term steam costs has been an important factor in the choice of Union boilers. Over 67 years of experience in steam generation stands behind their proven performance.

GET FULL DETAILS on how Union Steam Generators can stretch your fuel dollars. Available for oil or gas firing, they're built in many sizes and types to meet a wide range of steam requirements. Write for illustrated Catalog GB-153.



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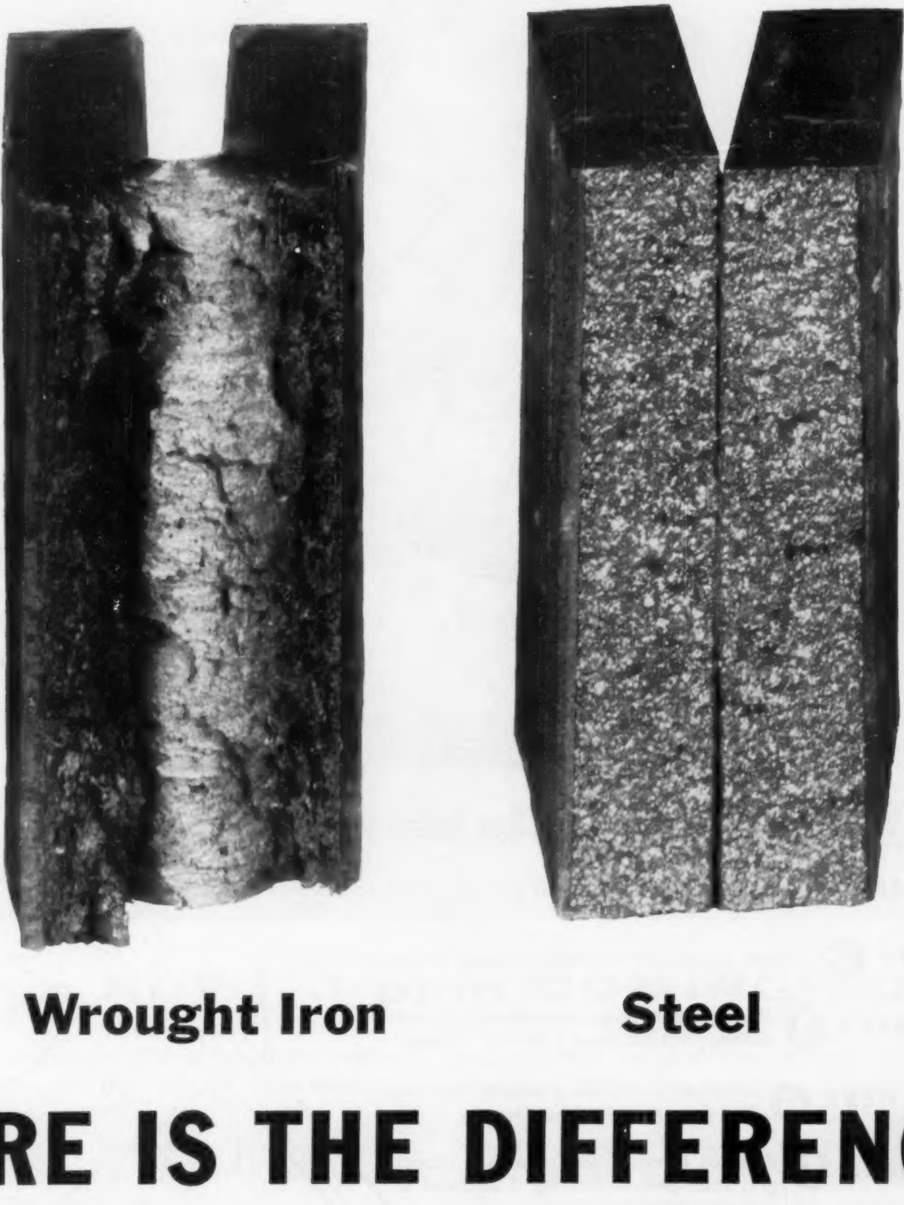


Wrought Iron

Steel

HERE IS THE DIFFERENCE

These are actual photographs of fractured pieces of wrought iron and steel. Photo at left shows how the fibrous structure of wrought iron differs from that of steel.

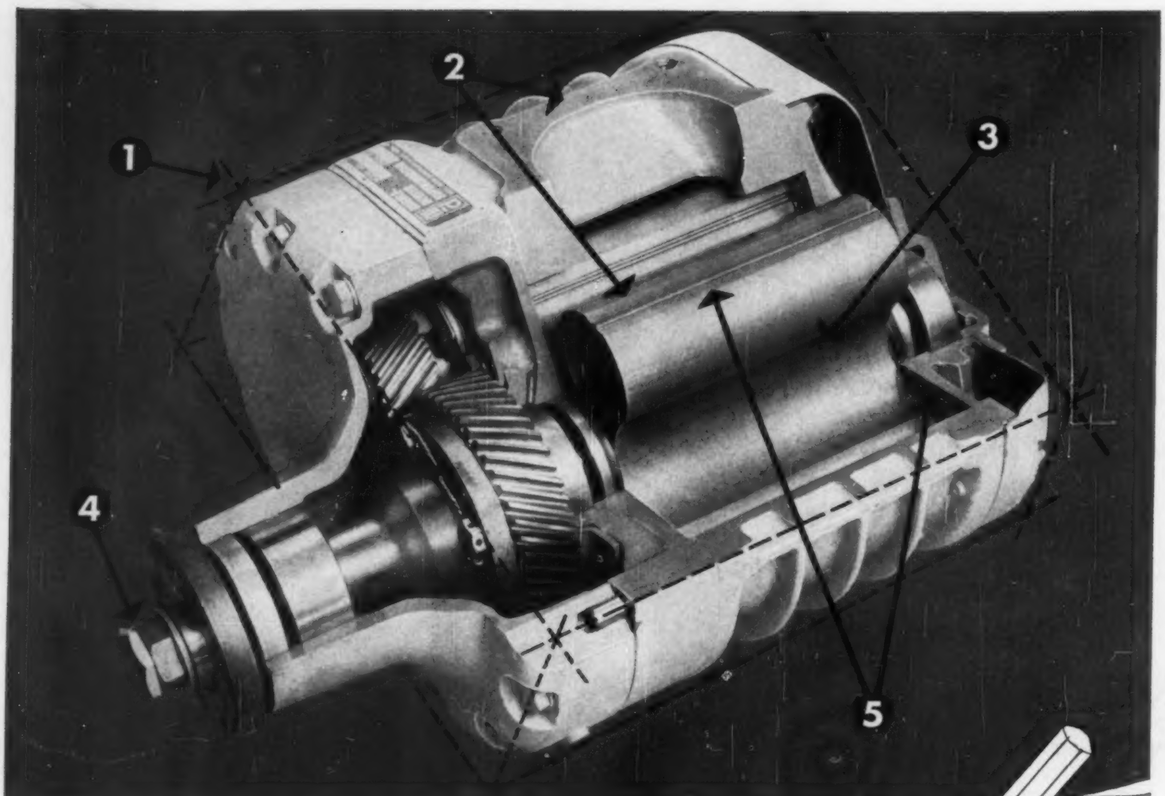
Many thousands of glasslike iron silicate fibers entrained in the pure base metal account for wrought iron's unique structure. Duplicated in no other metal, this structural feature gives wrought iron its superior resistance to corrosion and fatigue stresses.

While *initial* cost may be higher, case histories of countless applications prove wrought iron the most economical buy because it lasts so long in actual service. Ask the Byers Field Service Engineer to show you fractured pieces similar to those shown above. For further information write for our booklet, *Piping for Permanence*. A. M. Byers Company, Clark Building, Pittsburgh 22, Pennsylvania.

BYERS Wrought Iron Tubular and Hot Rolled Products

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Corrosion costs you more than Wrought Iron



The **BIG** difference in blowers is...

HERE ❶ Smallest cube dimensions of all rotary positive blowers.

HERE ❷ Lightest weight with aluminum housing and rotors.

HERE ❸ Wide pressure range—exclusive 3-lobe rotors deliver pressures from 1 through 12 psig.

HERE ❹ Direct drive at 1160, 1750 and 3500 RPM. Belt drive at intermediate speeds.

AND HERE ❺ Patented formica wear strips and rubber grid seals prevent freezing if operated at excessive pressures.

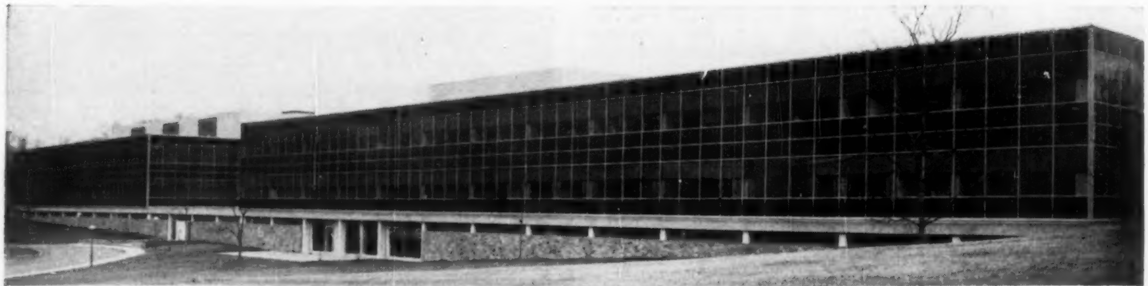
The performance figures are convincing... ...write today!

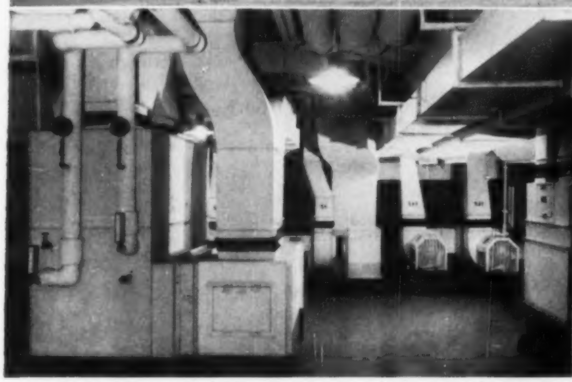
Miehle Dexter

Important advantages in pressure range, size, weight, cost, service!

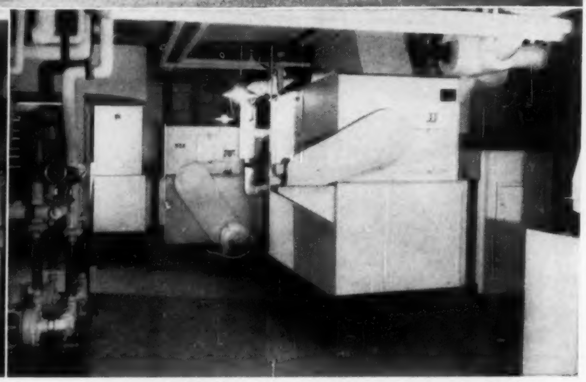
Miehle-Dexter Supercharger Division of The Christensen Machine Company, 100 Fourth St., Racine, Wis.

THE special world your little one lives in is only as secure as you make it. Security begins with saving. And there is no better way to save than with U.S. Savings Bonds. Safe—your interest and principal, up to any amount, guaranteed by the Government. Sound—Bonds now pay 3¼% when held to maturity. Systematic—when you buy regularly through your bank or the Payroll Savings Plan. It's so convenient and so wise—why not start your Savings Bonds program today? Make life more secure for someone you love.





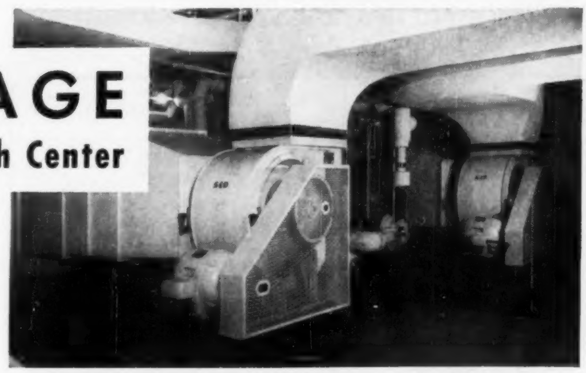
On left, Clarage Multitherm supplying conditioned air to the electrophoresis balance room. Exhaust fans in background.



In foreground, Multitherm supplying make-up air exhausted by laboratory hoods.

AIR via CLARAGE

in Wyeth's new Office and Research Center



Type HV fans supplying air to dining room and office interior.

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MECHANICAL ENGINEERING

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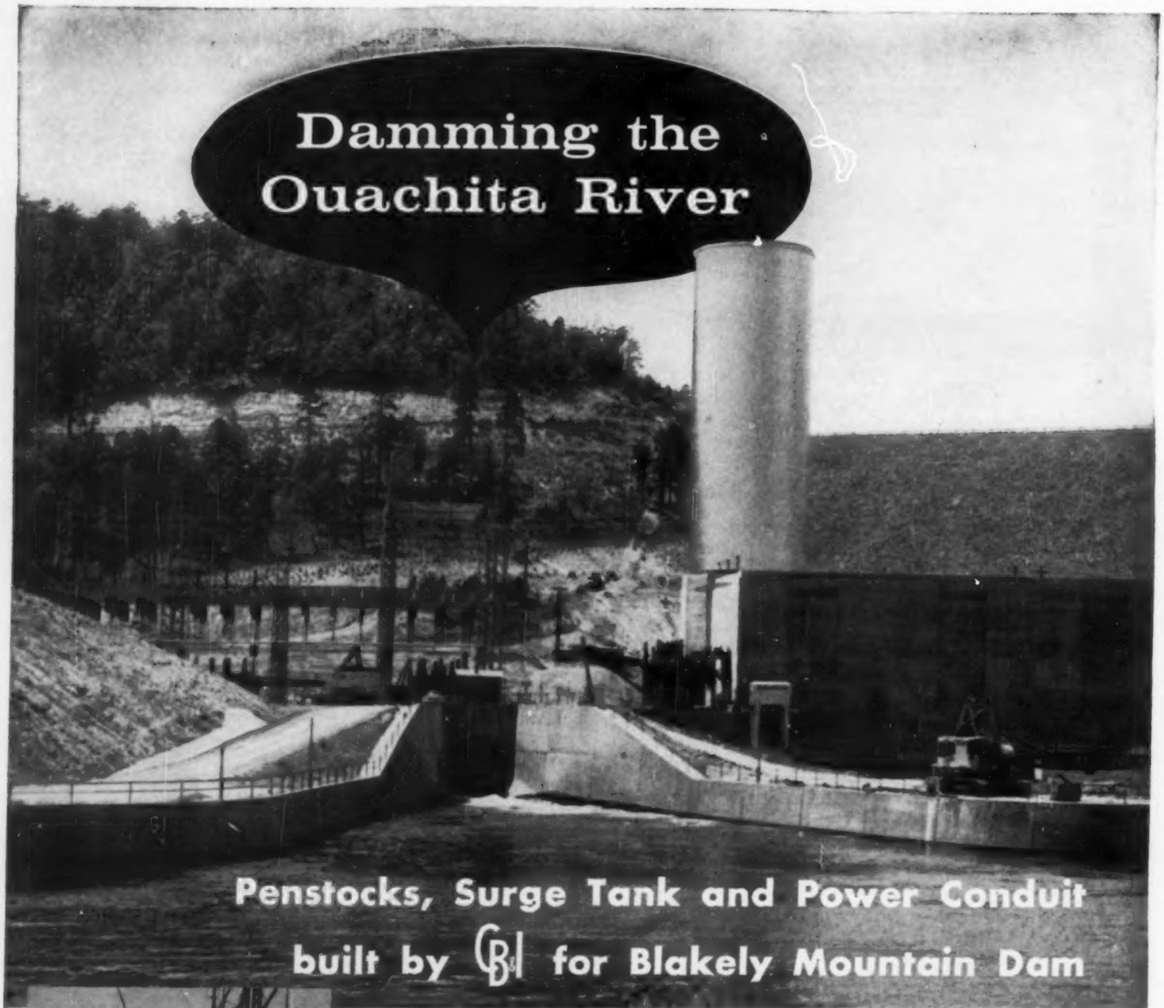
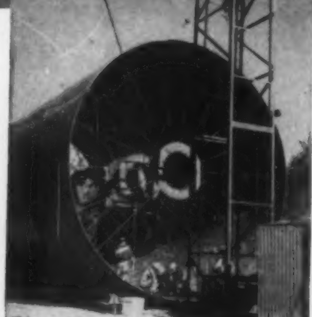
December, 1957 — Vol. 79, No. 12





Section of one of the penstocks fabricated and assembled by CB&I at Blakely Mountain Dam near Hot Springs, Arkansas.

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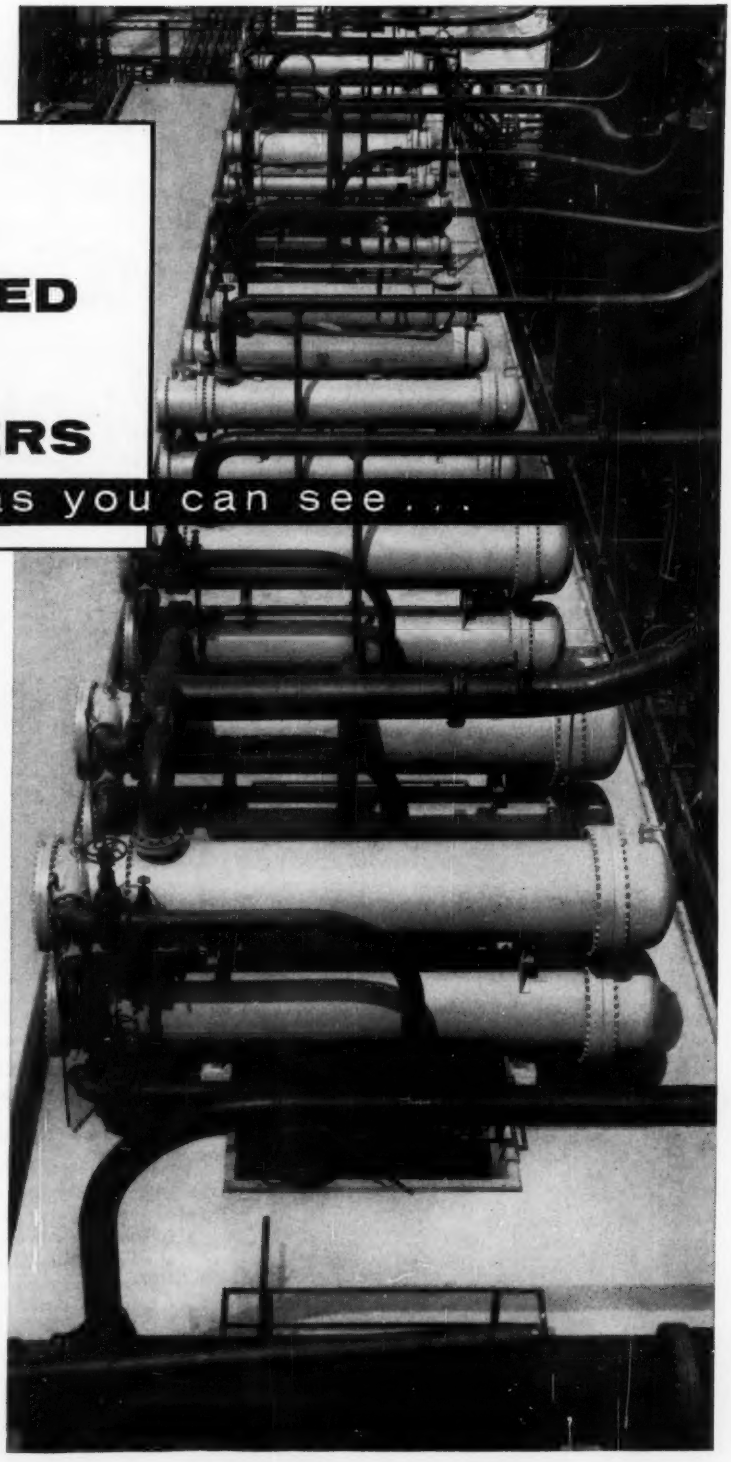

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